DOCUMENT RESUME

ED 264 836 IR 011 920

TITLE	Exploratory Computer Literacy Curriculum Guide, Grades 9-12.
INSTITUTION	Hawaii State Dept. of Education, Honolulu. Office of Instructional Services.
REPORT NO	RS-85-7793
PUB DATE	May 85
NOTE	155p.; For similar materials for grades 1-6, see ED 256 289 and ED 260 689; for a curriculum guide for grades 7-8, see IR 011 919.
PUB TYPE	Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC07 Plus Postage.
DESCRIPTORS	*Computer Literacy; Computer Science Education; Computer Simulation; *Computer Software; Curriculum Enrichment; *Microcomputers; *Models; Problem Solving; Programing; Secondary Education; State Curriculum Guides; Statewide Planning; Word Processing
IDENTIFIERS	BASIC Programing Language; Database Management Systems; *Hawaii; Spreadsheets

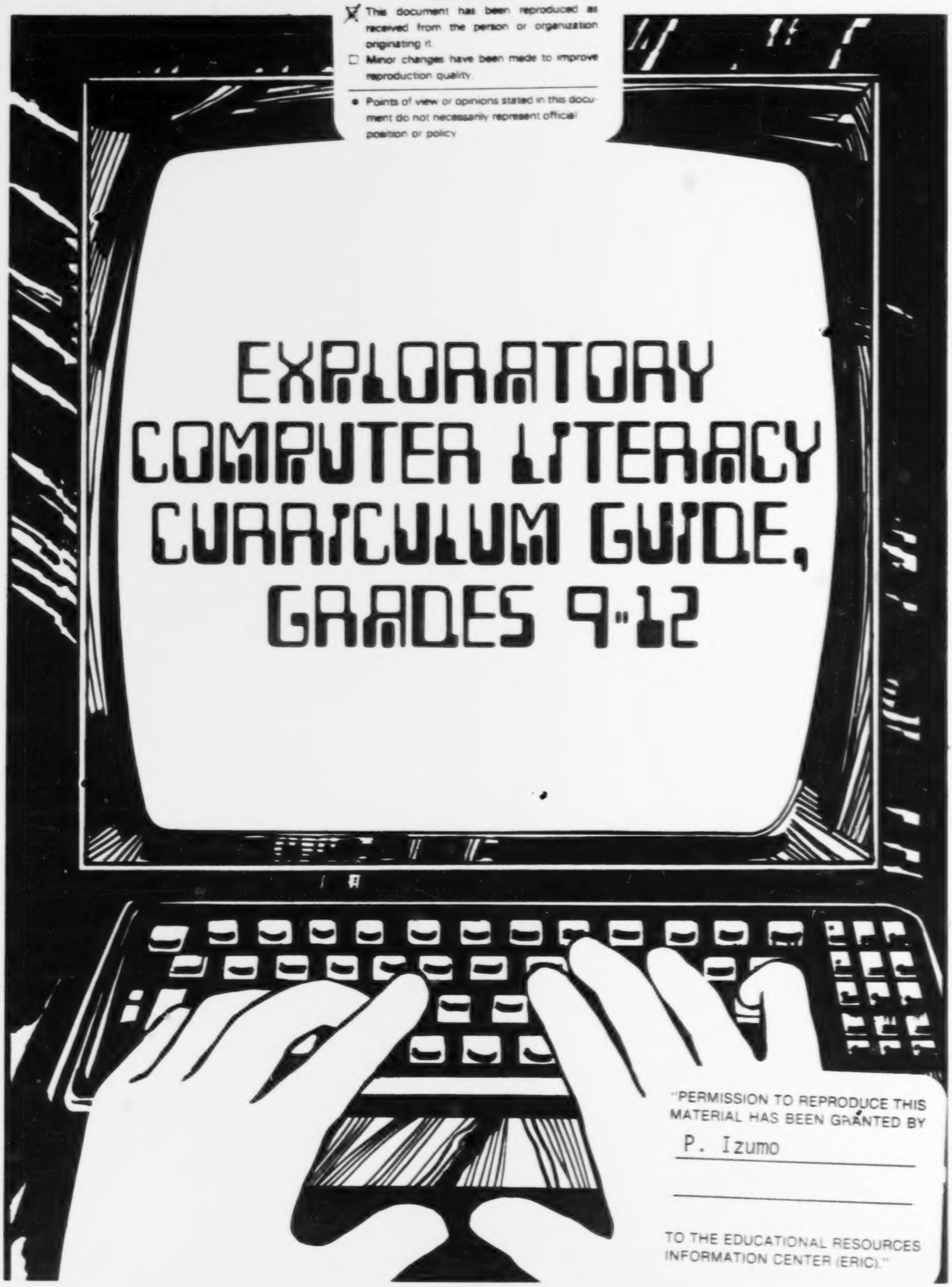
ABSTRACT

Designed to offer direction for classroom teachers and administrators in the development of an exploratory computer literacy program for grades 9-12, this resource unit comprises four major sections, four appendices, and two resource lists. The introductory section provides information on the history of Hawaii's computer literacy program; cites its three parts--an exploratory component, a computer science component, and a vocational-technical component; states this guide's intent to address the exploratory component; and explains the foundations and rationale for the publication. The section on curriculum addresses such questions as: (1) where this new program will be placed in the curriculum; (2) the instructional modes that will be involved; and (3) the teaching methodology that will be used. Four examples of instructional modes--topic, tutor, tutee, and tool--are explained and prescribed for specific educational situations. Four guidelines are given to assist secondary schools in implementing the exploratory computer literacy program, and five models are listed for delivering exploratory computer literacy via courses, unit content, or computer laboratories. Curriculum guidelines include a taxonomy of goals, objectives, and student expectations for exploratory computer literacy in grades K-12. A scope and sequence chart condenses the taxonomy into essential phases and shows, for grades 9-11 and grade 12, the benchmark grade at which it is recommended that student expectations be met. The final section provides sample activities for classroom use within the major categories of entry level, language arts, mathematics, science, and social studies. Each sample activity includes suggestions for teachers on instructional mode, prerequisites, classroom management materials, time for activity, and teacher preparation. Appendices include an exploratory computer literacy framework, task force recommendations, a glossary of computer acronyms and terms, and bonus activities. Resources listed include teacher references and recommended periodicals, and related films and videotapes. (JB)

U.S. DEPARTMENT OF EDUCATION
OERI
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official position or policy.

ED264836

EXPLORATORY COMPUTER LITERACY CURRICULUM GUIDE, GRADES 9-12



"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
P. Izumo

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR011920

OFFICE OF INSTRUCTIONAL SERVICES/GENERAL EDUCATION BRANCH ☐ DEPARTMENT OF EDUCATION
STATE OF HAWAII ☐ RS 85-7793 ☐ MAY 1985

The Honorable George R. Ariyoshi
Governor, State of Hawaii

BOARD OF EDUCATION

Rev. Darrow L.K. Aiona, Chairperson
Mako Araki, First Vice-Chairperson
Randal Yoshida, Second Vice-Chairperson

Margaret K. Apo
Sherwood M. Hara
Dr. Hatsuko F. Kawahara
Michael Matsuda
Ronald Nakano

Charles Norwood
John R. Penebacker
Akira Sakima
Meyer M. Ueoka
William A.K. Waters

Francis M. Hatanaka, Superintendent of Education
Dr. Margaret Y. Oda, Deputy Superintendent

Bartholomew A. Kane, State Librarian

Claudia Chun, Assistant Superintendent
Office of Instructional Services

Vernon H. Honda, Assistant Superintendent
Office of Business Services

Albert Yoshii, Assistant Superintendent
Office of Personnel Services

William Araki, District Superintendent
Leeward District Office

Gordon Kuwada, District Superintendent
Central District Office

Lokelani Lindsey, District Superintendent
Maui District Office

Dr. Kiyoto Mizuba, District Superintendent
Hawaii District Office

Dr. Mitsugi Nakashima, District Superintendent
Kauai District Office

Claudio Suyat, District Superintendent
Honolulu District Office

Kengo Takata, District Superintendent
Windward District Office

FOREWORD

Computer applications are increasing in research, business, and industry to the point where their effects impact almost daily on the lives of people. More recent advances have drastically reduced costs to make the computer available for use in small businesses, recreation, and even the home. This guide is an effort to provide direction for a computer literacy program in which all students in Grades 9-12 can gain experiences and knowledge that will enable them to function in a society dependent on computer technology.

The Exploratory Computer Literacy Curriculum Guide, Grades 9-12 is designed to help the classroom teacher choose materials and activities for students in implementing computer literacy. The guide is offered in the beginning stages of computer literacy and thus will undergo periodic revision. Because of the dynamic nature of the computer program in our schools, users must remain alert to evolving trends both locally and nationally. The section titled Resources will accommodate instructional units to be developed as future needs arise. Included in the Resources section is the Teacher References list, which provides sources of further information.

We hope that all high school level teachers and principals will find this guide useful for initiating and directing computer literacy programs in their classrooms and schools.

Francis M. Hatanaka

Francis M. Hatanaka, Superintendent

ACKNOWLEDGMENT

The Exploratory Computer Literacy Curriculum Guide, Grades 9-12, reflects the joint efforts of the staff at the University of Hawaii Curriculum Research and Development Group and at the Department of Education, Office of Instructional Services through an ECIA Chapter 2 developmental grant. The draft version of the guide for grades 7-12 was developed by the Curriculum Research and Development Group under the leadership of Dr. Francis Pottenger III. Evaluation of the pilot use of the draft was conducted by the Curriculum Research and Development Group under the leadership of Dr. Morris Lai. Revision of the draft into separate guides for grades 7-8 and grades 9-12 was done through Developing Instructional Computing, an ECIA, Chapter 2 Project, under the management of Rosemary Hill Darabian, General Education Branch, Office of Instructional Services.

Recognition is extended to the teachers, private school representatives and university personnel who assisted in the development of the Computer Literacy Framework (Exploratory Component) which provides the foundation for this guide.

The efforts of the members of the Task Force on the Delivery of Computer Programs at the Secondary Level are recognized for developing alternatives that the schools could consider in delivering exploratory computer literacy.

Appreciation is extended to the teachers in the pilot schools whose input was invaluable in the revision of the guide. They are:

Sandra Shirachi	Castle High School
Gerald Inforzato	Farrington High School
Sadao Hamada	Leilehua High School
Robert Keane	Leilehua High School
Hiroji Mende	Leilehua High School
Elaine Tom	Leilehua High School
Christine Marcello	Waialua High School
Michael Min	Waialua High School

The Department of Education also acknowledges the following state, district and school personnel who provided recommendations and support in the development of the guide:

Evelyn Horiuchi	Educational Specialist, Computer Education
Judy McCoy	Educational Specialist, Language Arts
Miles Muraoka	Educational Specialist, Science
Kathleen Nishimura	Educational Specialist, Mathematics
Dr. Elaine Takenaka	Educational Specialist, Social Studies
Velma Omura	Honolulu District Educational Specialist
Betty Mow	Central District Educational Specialist
Kerry Koide	Leeward District Educational Specialist
Nellie Matsunami	Windward District Educational Specialist
Lynette Okita	Waialua High School Teacher

Special recognition is extended to Carol Yoshioka for her artistic contributions and word-processing skills.

TABLE OF CONTENTS

INTRODUCTION

Introduction 3
Computer Literacy Components 4
Thematic Nature of the Exploratory Component 4
Foundations of the Guide 4
The Computer Literacy Framework 5
The Guide Rationale 5

CURRICULUM DESCRIPTION

Curriculum Relationships 9
Instructional Modes 11
Examples of Instructional Modes 12
Implementing the Exploratory Computer Literacy Program 13

CURRICULUM GUIDELINES

Taxonomy of Objectives 17
Student Expectations 23
Scope and Sequence 27

ACTIVITIES

Activity Guidelines 35
Sample Activities - Entry Level 37
Sample Activities - Language Arts 59
Sample Activities - Mathematics 71
Sample Activities - Science 89
Sample Activities - Social Studies 99

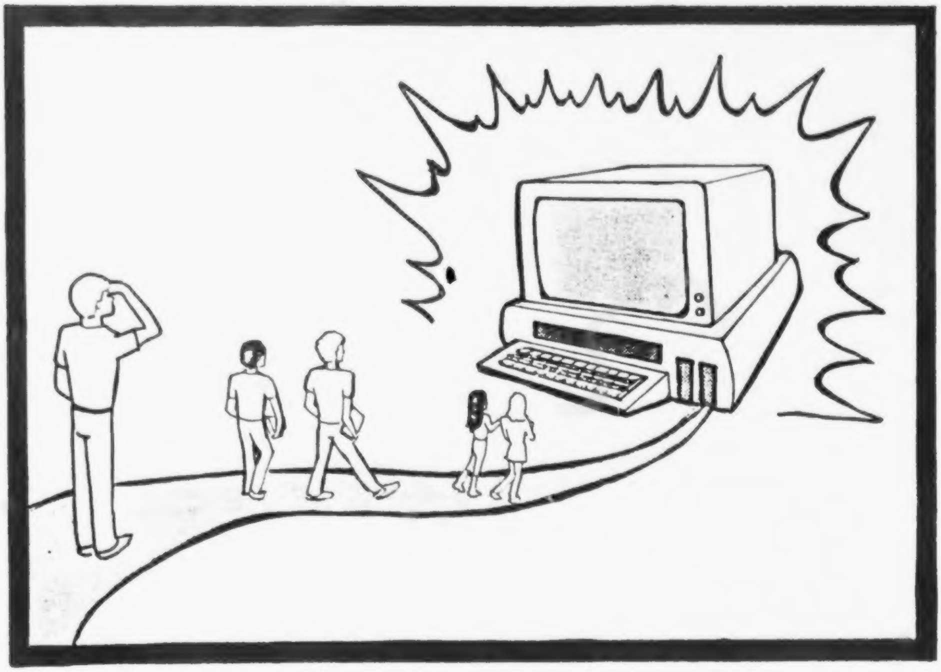
APPENDIX

Appendix A - Exploratory Computer Literacy Framework 117
Appendix B - Task Force Recommendations 125
Appendix C - Glossary of Acronyms and Terms 133
Appendix D - Bonus Activities 157

RESOURCES

Teacher References and Recommended Periodicals 167
Films and Videotapes 173

INTRODUCTION



INTRODUCTION

Computer literacy brings a new challenge to the schools of Hawaii because it involves the study of an emerging technology. This guide is designed to offer direction for teachers and administrators in the development of an exploratory computer literacy program for grades 9 through 12. The literacy program outlined will provide a foundation on which schools can design a program for developing students' understanding and appreciation of computers in our society.

The intent of the exploratory component of computer literacy is to develop an awareness, appreciation, and understanding of the functions and impact of computers in daily life. This component is a thematic area of the curriculum in that the delivery in the classroom is designed for interfacing with all regular subject areas. Instructional areas addressed in the Activities section are language arts, mathematics, social studies, and science.

The initial work for the exploratory component of computer literacy was undertaken by an advisory group of teachers and educational specialists who defined the rationale, goals, and objectives of the program in the Computer Literacy Framework (Exploratory Component). The Framework provides the curricular goals, objectives and benchmark student expectations for Grades 3, 6, 8 and 12 used to formulate this 9-12 guide. An elementary guide was completed in 1984 for Kindergarten through grade 6. This high school guide has been developed to continue the program for computer literacy awareness and to help teachers work toward the benchmark student expectations for grade 12 and reinforce concepts learned earlier by their students. A guide similar to this one has been developed concurrently for the intermediate school level.

Computer Literacy Components

There are three components of Hawaii's computer literacy program: an exploratory component, a computer science component and a vocational-technical component. The computer science and vocational-technical components are intended for secondary school use only, while the exploratory component is for both elementary and secondary levels. This guide deals with the exploratory component of computer literacy for grades 9-12.

The exploratory component of computer literacy aims to develop computer-literate students who can function in a society where contact with computers is becoming a daily necessity. For purposes of setting educational standards, students who are computer literate are those who have an awareness, appreciation and understanding of the functions of computers and their impact on daily life; feel confident in using computers; have a knowledge of how computers can be used as a tool for problem solving and decision making; recognize the limitations as well as the usefulness of computers in advancing human welfare; and recognize the educational and career opportunities related to the specific and general uses of the computer.

Thematic Nature of the Exploratory Component

The exploratory component of computer literacy is a thematic area of the curriculum. Thematic areas are those special areas of school programs (such as career education, environmental education and exploratory computer literacy education) in which instruction can be delivered within regular subjects. Exploratory computer literacy can be integrated in the traditional subjects of language arts, mathematics, science and social studies, and it can be incorporated in other thematic areas.

Foundations of the Guide

The exploratory component of computer literacy introduces computers into the school curriculum with minimum disruption of current programs. Computer literacy was pioneered by groups such as Minnesota Educational Computing Consortium and the Department of Computer Science, California State University at Chico. The National Council of Teachers of Mathematics was also instrumental in raising the awareness of the nation's schools for the need to introduce computer literacy into the school curriculum through its paper, Agenda for Action, Recommendations for School Mathematics of the 1980's. In this paper, the Council takes the strong stand that mathematics programs should "take full advantage of the power of calculators and computers at all grade levels...." It goes on to say, "A computer literacy course, familiarizing the student with the role and viewpoint of the computer, should be part of the general education of every student."

In Hawaii the inclusion of computer literacy in the curriculum was established within the Department of Education Plan for Computers in Education, which describes the major areas for using computers in education. The exploratory component of computer literacy was further developed by an advisory group composed of educational specialists and teachers from elementary, intermediate, high schools and colleges in the private and public sectors. The recommendations of this group provided a basis for the exploratory computer literacy framework for grades K-12. This Exploratory Computer Literacy Framework, hereafter called Framework, provides the foundation for the present guide.

The Computer Literacy Framework (see Appendix A)

The Framework identifies the curricular objectives and the benchmark student expections related to the State Plan for Computers in Education. It provides the basic structure for the exploratory component of computer literacy. The benchmark student expectations are statements of competence that students are expected to attain at various benchmarks - in grades 3, 6, 8 and 12. They are written in the form of demonstrable behavior that requires an application of knowledge, skills or attitudes.

The Guide Rationale

The teacher who incorporates computer literacy into the classroom will gain a new set of instructional alternatives. The computer can be a patient, non-judgmental tutor for the slower student and a quick-responding, multi-faceted problem solver for the exceptional student. It can be used not only as a tutor or tool but also as a tutee or topic. More will be said about instructional modes in the next section.

This guide attempts to give teachers direction so that the computer is not used for only one purpose. There are student expectations that require skill and knowledge, and there are other expectations that call for positive attitudes and experimentation, so that the computer will not become an unrelenting drillmaster or a device just for games. The guide gives direction while providing enough latitude for exploration, experimentation and individual growth.

CURRICULUM DESCRIPTION

CURRICULUM DESCRIPTION

Several questions must be addressed for the classroom implementation of computer literacy: (1) Where in the curriculum will this new program be placed? (2) Which instructional modes will be involved? (3) What teaching methodology will be used?

Curriculum Relationships

Due to the thematic nature of the exploratory component of computer literacy, the subject matter is lodged in both its own curriculum space as well as that of existing instructional areas: principally, mathematics, science, social studies and language arts.

Mathematics. In one of its four goals, the Mathematics Program Guide includes:

> "...understanding the uses and limitations of modern technological advances such as computerization...."

The concept of computer literacy is further endorsed in the statement of Ten Basic Skill Areas appended to the Mathematics Program Guide:

> "It is important for all citizens to understand what computers can and cannot do....The increasing use of computers in government, industry and business demands an awareness of computer uses and limitations."

Computer literacy has been a concern of the mathematics community for many years. The computer is a major tool of today's mathematician, and mathematicians have contributed to each step of its evolution. Therefore it is not surprising that computer programs for the delivery of each of the major topics of the mathematics guide (numbers, operations, geometry, measurement and problem solving) are available in computer software.

Science. The Secondary Science Curriculum Guide incorporates a variety of statements in its goal and objectives structure that support the intent of computer literacy. The one most encompassing objective reads:

> "Facilitate the students ability to use scientific
> knowledge, processes, instruments and language
> to clarify values, examine issues, and solve problems
> in fulfilling personal, social and career life roles."

Within the scientific community the computer has become an essential tool in data analysis and hypothesis and model generation since the 1950's. It has become so versatile that applications are found in almost every modern scientific laboratory. As a tool, the computer functions to enhance the basic informational processing capacity of the scientist. In keeping with this trend, the Science Curriculum Guide emphasizes the process skills of science. These skills are:

observing
classifying
measuring
using space-time relationships
collecting and analyzing data
graphing
inferring and predicting
making and testing hypotheses
identifying and controlling variables
model building
using equipment
using scientific vocabulary
communicating
thinking
process integration

Software has been produced to facilitate development of these skills. Also the microcomputer-based laboratory (MBL) is becoming more widely available to science teachers. MBL gathers data directly from the environment by means of low-cost transducers. "These devices measure physical properties (such as light and temperature), translate the measurements into computer-readable electrical currents, and then display them on the computer monitor....Such interfacing techniques turn the microcomputer into a tool that allows students to quantify the world about them just as real scientists do." (Electronic Learning, Feb. 1985, pp. 44-47.)

Language Arts. Two of the three program goals in the Language Arts Program Guide, K-12, are closely related to the goals of the exploratory component of Hawaii's computer literacy program:

> "To assist students to develop, to the highest degree possible, informed control over their use of language.
>
> To increase student understandings of the nature and structure of the English language within the broad perspective of communication."

Computer applications in word processing and information storage have created a revolution in business and industry that is now spilling over into the operation and management of the home. More and more students come from homes where a computer is as much a part of the furniture as is the radio, TV, telephone and electric lamp. More and more students are coming to school with assignments composed at the computer keyboard.

Integrated courseware packages have evolved to include programs which offer prewriting instruction, a word processor and editing aids, enabling student compositions to be generated, stored and revised with ease. Writing for students need no longer involve tedious revision and retyping. Word processing can provide more time for creativity and development of thought.

Computers have also long since invaded the realm of literature. Science fiction literature with futuristic themes is filled with references to computers, and literature is a natural source of valuable commentary on the potential power and limitations of computers.

Social Studies. Computers are as much a tool of the social scientist as of the physical or biological scientist. Wherever collection, storage, retrieval or analytical processing of large amounts of information is necessary, the computer is being used.

Spreadsheets and statistical programs provide opportunities for students to exercise research skills. All-purpose data base programs can help students develop their own data base for a particular sociological study and then formulate good questions to pull generalizations from the data. Future computer conferencing among schools sharing large data bases is a definite potential with on-line interaction of computers. These applications of computers in this subject area support goal number five in the Secondary Social Studies Program Guide:

> "The student is able to select and use appropriate criteria, procedures and information sources to assess the validity or significance of findings about past, present or future human life or affairs."

Computers are having, and will have, more powerful effects on society and individuals than anyone can imagine or predict. Our hope for making wise and beneficial use of technology and avoiding some of the potential disasters is to have an educated citizenry with an attitude of responsibility and a sense of control. Thus the impact of computer technology on society is a continuing topic of study and conjecture by the social science community.

Instructional Modes

It is recognized that students will gain knowledge of computers through several modes or methods of instruction. Four categories of instructional modes will be used in the classroom. Three involve the use of computers. The four categories are:

- the computer as a tutor,
- the computer as a tutee,
- the computer as a tool,
- the computer as a topic.

The computer as a tutor includes methods of instruction which use the computer to guide a student through a lesson. These include:

- Drill and Practice
- Games and Simulation
- Testing and Response
- Tutorial Instruction

The computer as a tutee includes methods of instruction using computer programming techniques by students who instruct the computer to perform a specific task. These include:

- Problem Solving
- Algorithm Construction
- Flowcharting
- Programming

The computer as a tool includes methods of using the computer to provide a service to the student. It acts as an instructional aid. Many of these are teacher management uses from which the students receive direct output. In others, students use the computer as a simple processing device as they would a calculator or a typewriter. These include:

- Test Scoring
- Attendance
- Curriculum Material Generation
- Grade Keeping
- Material Management
- Communications
- Data Processing
- Word Processing

The computer as a topic deals with instruction in the mechanics of computers, how computers function and their impact on the areas of science, technology and education as well as daily life. With this mode, the computer is not directly used. The facets of study include the:

- Structure and functions of computers as machines
- History of the computer
- Career opportunities in computers
- Social impact of the computer
- Value of the computer to self and society
- Uses of the computer in society.

Examples of Instructional Modes

To meet the computer literacy student expectations, the various instructional modes discussed above will be used. For example, to meet the twelfth grade expectation, "The student recognizes that computers process information by searching, sorting, deleting, updating, summarizing, storing, etc.," all four modes of instruction can be utilized to provide the student with the learning experience necessary to satisfy the expectation.

In the Topic Mode, a student can be introduced to the use of the computer as a tool for writing via a lecture-discussion of the role of the computer in processing information, the common features of word processing systems and specific features of the word processor which will be used in the computer laboratory.

In the Tool Mode, a word processor can be utilized by the student for an English composition assignment.

In the Tutor Mode, a software package can provide a student with instruction in essential areas of writing skills and can maintain a data management system for teacher and student to follow his or her path of achievement, illustrating the process of information manipulation.

Finally, in the Tutee Mode, the student could design, code and run a search and sort program to alphabetize any list of students' names.

Some instructional modes may be more appropriate to certain subject areas for a particular student expectation. However, the greater the number of instructional modes utilized, the greater the probability for achieving and reinforcing the particular student expectation.

Implementing the Exploratory Computer Literacy Program

In implementing a program of exploratory computer literacy in a classroom, the availability of resources must first be considered. Since school resources (hardware, software, personnel, budget, facilities) vary, each school must determine for itself the most appropriate instructional arrangement for delivery of exploratory computer literacy. The Computers in Instruction--Framework for Administrators guide, developed in 1984 by the General Education Branch, Office of Instructional Services, Department of Education, provides guidelines to administrators in planning their local school efforts for implementing the computer literacy program.

The Task Force on the Delivery of Computer Programs at the Secondary Level was created to examine the current needs for computer-related programs at the secondary level and to provide guidelines for implementing the three components of computer literacy, one of which is the exploratory component.

The following guidelines were developed by this Task Force to assist secondary schools in implementing the exploratory computer literacy program.

1. The school administrator, in consultation with the staff and other resource personnel, shall determine the instructional arrangement for delivery of the exploratory computer literacy program within available resources.

2. The frequency and length of the instructional unit shall also be established within available resources.

3. The school shall be responsible for developing a computer acquisition program for the delivery of instruction.

4. The school shall determine what personnel will be used to provide exploratory computer literacy instruction. The school should work with district personnel for the inservice training needs of its staff.

The following models for delivering exploratory computer literacy were developed by the Task Force as alternatives the schools could consider in offering this thematic area. Further details on the alternative models are provided in Appendix B. Examples of these instructional models or management schemes are incorporated in the Activities section.

1. Elective One-Semester Courses

   Semester courses, addressing the student expectations identified for grade 8 or grade 12, may be offered as an elective. The courses would consist of classroom instruction in combination with hands-on experiences in a computer lab to maximize the number of students accommodated by the program.

2. Unit Within Content Area Course

   A unit of study of set duration (4-8 weeks) would be worked into a part of a required course (e.g., language arts, social studies, mathematics). The unit would consist of hands-on experiences in a computer lab preceded by classroom instruction.

3. Shared Computer Lab or Resource Center

   Instruction in computer literacy would be conducted in regular classrooms through existing courses (e.g., language arts, mathematics, social studies, science, business). Hands-on experiences would be provided in a computer lab where use is scheduled according to school-established procedures.

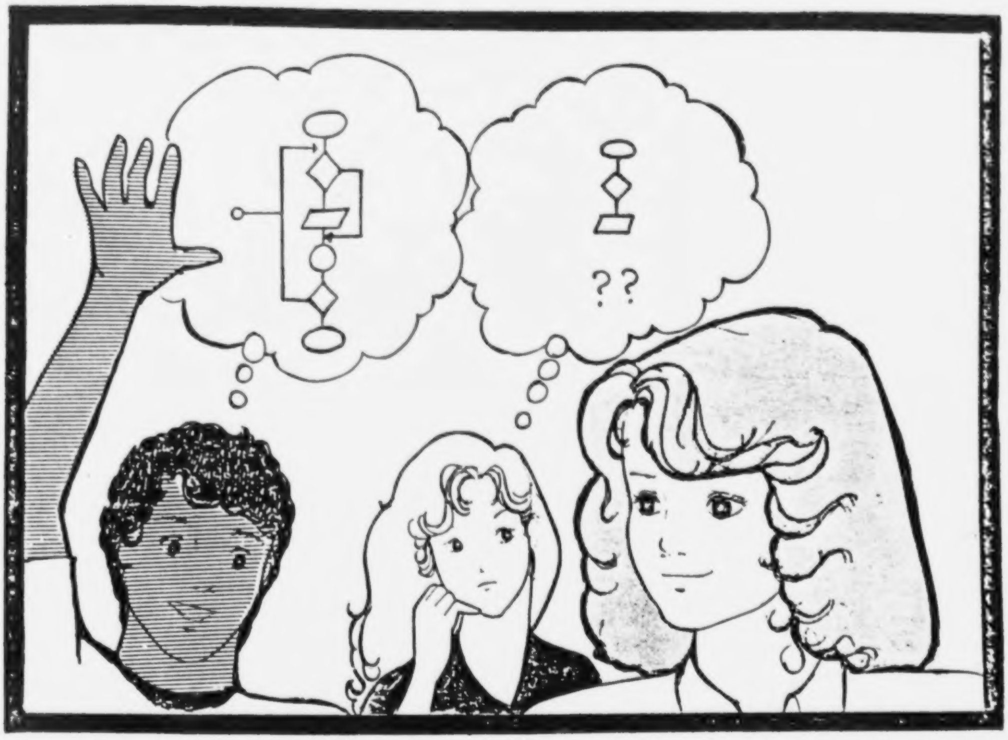
4. Computer Mini-Lessons

   A series of mini-lessons on different aspects of computer literacy could be introduced through existing courses in several content areas. Hands-on experiences could be provided in the classroom on a rotation basis so that a limited number of microcomputers could be rotated among the classrooms involved.

5. Demonstration Mode

   A unit of study for a set duration would be taught in an existing content area course using one microcomputer. Instruction would be primarily through vicarious experiences provided through demonstrations, audio-visual presentations and off-computer exercises. This mode is included as an initial, interim model until schools are able to acquire additional equipment to increase students' hands-on time.

CURRICULUM GUIDELINES



CURRICULUM GUIDELINES

The guidelines for the development of the content of exploratory computer literacy are included in the following sections: the Taxonomy of Objectives, which provides a complete statement of the goals, objectives and student expectations of the exploratory computer literacy program; the Student Expectations for exploratory computer literacy, which provide the behavioral standards for the program; and the Scope and Sequence Chart, which identifies the contributions of four subject areas in meeting the goals of exploratory computer literacy. The following descriptions of the Taxonomy, Student Expectations and the Scope and Sequence Chart are important for understanding the Activity Guidelines found in the next section.

The Taxonomy of Objectives

The Taxonomy of Objectives was derived from the Exploratory Computer Literacy Framework. (See Appendix A.)

The Taxonomy which is an analytical outline of the Framework has these design features:

1. Goals are listed and subdivided into objectives which are further subdivided into student expectations.

2. Objectives are phrased so that they can be used to identify relevant classroom materials.

3. The numerical identification system is designed to accept expansion or reduction of goals and objectives as experience requires.

The numeric system of the Taxonomy consists of one-, two- and three-digit numbers, each separated by decimal points. The first digit always represents a goal, whether it stands by itself or in a two- or three-digit number. Likewise, the second digit represents an objective and the third digit stands for a student expectation.

The coding of the Taxonomy can be expanded by adding numbers at the appropriate decimal position. For example, there are presently five goals covered in the K-12 Framework. If it were necessary to add a sixth goal, it could easily be inserted by adding another section that would start with the number six, listing the objectives and expectations below in the prescribed decimal position. Deletions can be made by dropping any goal, objective or expectation that is no longer needed. If an entry is deleted, all subordinate entries must be deleted and the numbering of subsequent entries adjusted.

Use of the Taxonomy's numeric system is found in all the instruments to give a common basis for identification of exploratory computer literacy components. It is used in the Student Expectations Chart, the Scope and Sequence Chart and the specific Activities.

The Taxonomy of Goals, Objectives and Student Expectations for Exploratory Computer Literacy, Grades K-12

GOAL 1: The student will feel confident about using computers.

1.1. Interacts with a prepackaged computer program.

1.1.1. The student recognizes that a computer needs instructions to operate.
1.1.2. The student reads computer instructions, keyboard and output.
1.1.3. The student uses basic control keys and commands.
1.1.4. The student selects and uses appropriate written resources (e.g., handouts, manuals) for operating the computer.
1.1.5. The student experiments with programs as a user.
1.1.6. The student takes appropriate action in response to error messages in using prepackaged programs.

1.2. Identifies the need for information to be processed according to a set of predefined computer rules: organized, coded, given meaning and transmitted.

1.2.1. The student gives reasons for processing information.
1.2.2. The student identifies the structural components of information processing, e.g., organizing, coding, processing and reporting.
1.2.3. The student sequences the steps required in a process.
1.2.4. The student recognizes that computers process information by searching, sorting, deleting, updating, summarizing, storing, etc.

1.3. Given a simple algorithm/flowchart explains what it accomplishes, i.e., interprets, generalizes, and discusses applications.

1.3.1. The student interprets a simple algorithm/flowchart.
1.3.2. The student generalizes how an algorithm/flowchart is used.
1.3.3. The student discusses the applications of algorithms/flowcharts.

1.4. Identifies the fact that we communicate with computers through specific symbols and words.

1.4.1. The student recognizes that programming languages are used to give the computer instructions.
1.4.2. The student recognizes words or symbols that operate the computer.

1.5. Develops positive attitudes and behaviors toward computers.

1.5.1. The student demonstrates positive behaviors and attitudes towards computers by seeking work or play with computers.
1.5.2. The student demonstrates positive behaviors and attitudes towards computers by describing past experiences with computers with positive affect words like fun, challenging, etc.

GOAL 2: The student will know how the computer can be used as a tool for problem solving and decision making.

2.1. Uses computerized information systems (computer or computer system) to solve simple problems and make decisions.

2.1.1. The student uses the computer to assist in decision making.
2.1.2. The student translates a simple algorithm/flowchart into a program.
2.1.3. The student develops an algorithm for solving a specific problem and/or solve a set of similar problems.
2.1.4. The student describes how computers can assist in problem solving and decision making.

GOAL 3: The student will be aware of, appreciate and understand the functions and impact of computers in daily life.

3.1. Identifies and describes basic operations of computer systems including identification of input, memory, control, arithmetic and output components.

3.1.1. The student identifies the Input/Output peripherals.
3.1.2. The student describes the functions of the Input/Output and Processing (control, memory, arithmetic/logic) components.

3.2. Recognizes data processing, process control, and information storage and retrieval applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

3.2.1. The student identifies computer applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

3.3. Recognizes how computers affect employment, public surveillance, privacy of individuals, progress and culture, personalization/impersonalization, regulatory and enforcement functions, and daily relationships with people, agencies, organizations, etc.

3.3.1. The student values efficient information processing.
3.3.2. The student understands the advantages and disadvantages of routine tasks.
3.3.3. The student appreciates the economic benefits of computerization for society.
3.3.4. The student values increased communication and availability of information made possible through computer use.
3.3.5. The student understands that computers can be used to effect distribution and use of economic and political power, in criminal and other anti-social activities, to change society in undesirable ways.
3.3.6. The student identifies applications of computer science and technology in medicine, law enforcement, education, engineering, business, transportation, military, recreation, government, library and creative arts.

3.4. Recognizes that technology differs from science in that the aim of technology involves the means of building and doing useful things while the aim of science is the development of knowledge and understanding.

  3.4.1. The student knows how electronic technology evolved.

GOAL 4: The student will recognize the limitations as well as the usefulness of computer (science) technology in advancing human welfare.

4.1. Recognizes disadvantages of computers as tools, dependency, limitations, cost, etc.

  4.1.1. The student lists at least three limitations of computers in the advancement of human welfare.

4.2. Identifies major applications of computers for information storage and retrieval, simulation and modeling, quality or process control, and decision making and problem solving.

  4.2.1. The student describes how computers assist people in advancing human welfare.

GOAL 5: The student will recognize the educational and career opportunities related to the specific and general uses (applications) of computers.

5.1. Recognizes careers in Support Services (e.g., data entry, word processing, computer operations personnel), Technical Services (e.g., programmer, analyst, data processor, equipment maintenance and repair personnel), Scientific Personnel (e.g., computer scientist, electrical engineer, computer engineer) in the community that involve computers.

  5.1.1. The student identifies support service, technical and scientific careers that involve computers.
  5.1.2. The student identifies national and international careers that involve computers.

5.2. Recognizes opportunities related to integrating the computer in other careers.

  5.2.1. The student compares educational requirements and opportunities for careers that involve computers.

Student Expectations

To set standards and provide evaluation guidelines, benchmark expectations have been written into the Exploratory Computer Literacy Framework.

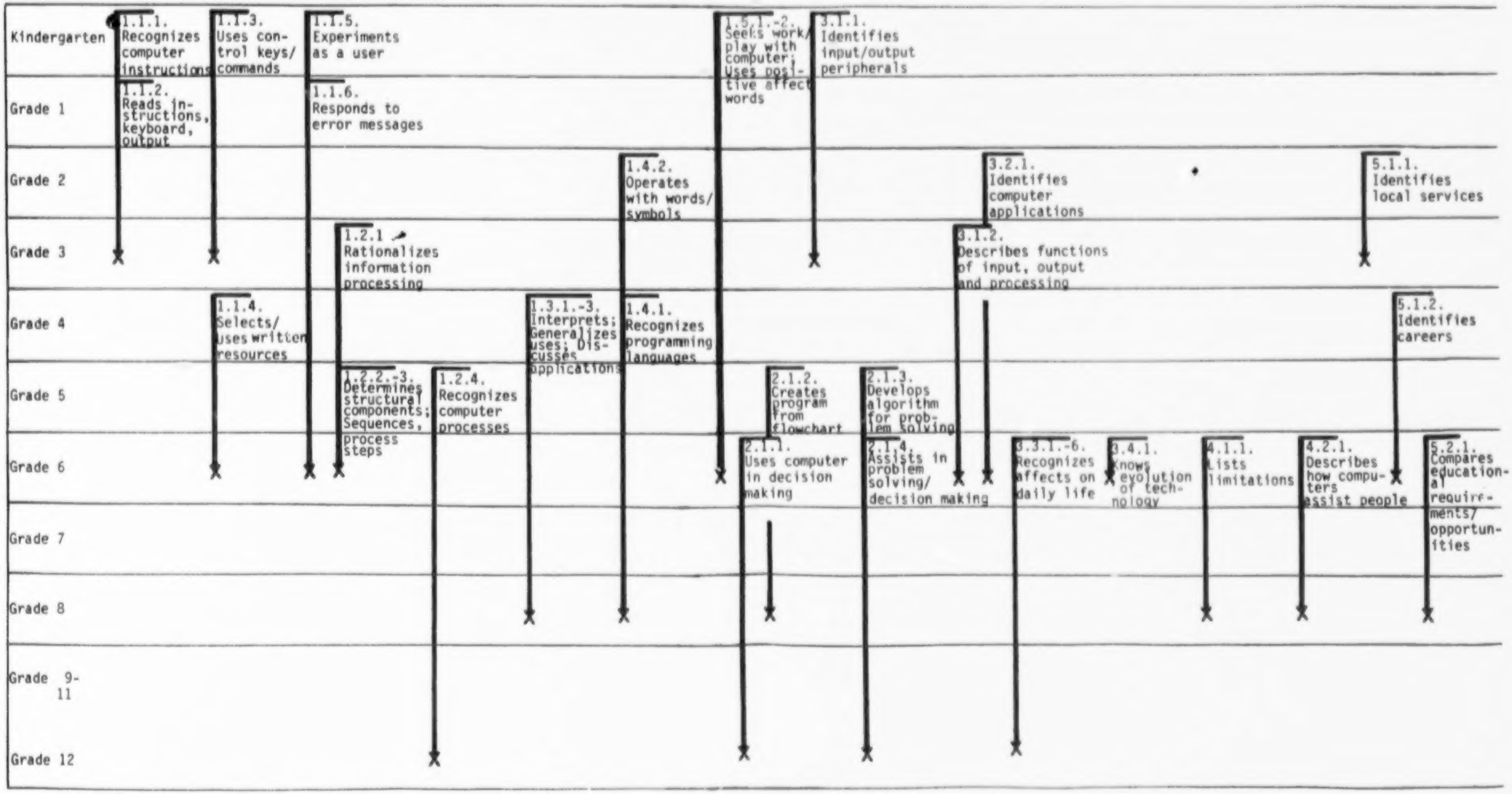
The student expectations are written in a form which calls for conduct that can be evaluated and which assumes the application of knowledge, skills and attitudes. These expectations provided that kind of basis for developing the activities outlined in the guide. In the chart on the following page, student expectations are shown that are benchmarked with an 'x' at grades 3, 6, 8 or 12.

A teacher of exploratory computer literacy at the high school level should aim for the expectations benchmarked at grade 12. For those students who have not yet attained the lower level expectations, the teacher should provide them with the background and experience necessary to fulfill all student expectations benchmarked through grade 12. The sample activities in the first category--Entry Level--offer introductory material for those students.

Activities that reinforce student expectations already achieved can strengthen students' skills and expand their level of knowledge.

STUDENT EXPECTATIONS CHART

Exploratory Computer Literacy K-12


Kindergarten
Grade 1
Grade 2
Grade 3
Grade 4
Grade 5
Grade 6
Grade 7
Grade 8
Grade 9-11
Grade 12
1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/ commands
1.1.4. Selects/ uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.2.1 Rationalizes information processing
1.2.2.-3. Determines structural components; Sequences, process steps
1.2.4. Recognizes computer processes
1.3.1.-3. Interprets; Generalizes uses; Discusses applications
1.4.2. Operates with words/ symbols
1.4.1. Recognizes programming languages
1.5.1.-2. Seeks work/ play with computer; Uses positive affect words
3.1.1. Identifies input/output peripherals
2.1.2. Creates program from flowchart
2.1.1. Uses computer in decision making
2.1.3. Develops algorithm for problem solving
2.1.4. Assists in problem solving/ decision making
3.2.1. Identifies computer applications
3.1.2. Describes functions of input, output and processing
3.3.1.-6. Recognizes affects on daily life
3.4.1. Knows evolution of technology
4.1.1. Lists limitations
4.2.1. Describes how computers assist people
5.1.1. Identifies local services
5.1.2. Identifies careers
5.2.1. Compares educational requirements/ opportunities

Scope and Sequence

The Scope and Sequence Chart brings together four important pieces of information and shows the interrelationships among them. It condenses the taxonomy into short essential phrases. It shows the point at which instruction towards student attainment of the student expectations is introduced or reinforced and indicates the benchmark grade at which each student expectation is recommended to be met. The chart also shows the contributions of the four subject areas--language arts, mathematics, science and social studies--and the generic module, Entry Level, in meeting the goals of exploratory computer literacy.

The numeric system of the taxonomy is listed on the left of the Scope and Sequence Chart. The one-digit numbers are the general goals and the two-digit numbers are the objectives. Each student expectation is indicated by a three-digit number and is identified with the grade level and subject area in which activities leading to its achievement or supporting its reinforcement are provided. Activities that introduce a student expectation are represented by the dotted shading, while activities that reinforce a student expectation already achieved are shown with the slashed shading. Slashed shading begins with the grade at which the benchmark expectations are to be met. Not all student expectations are appropriate to each subject area.

Scope and Seqence

░ concept, skill introduced

▨ concept, skill expectation reached and reinforced

	Bench-Mark Grade	GRADES 9-11					GRADE 12			
1. Confidence about Computer Use		Entry Level	Lang. Arts	Math	Science	Soc. Studies	Lang. Arts	Math	Science	Soc. Studies
1.1. Interacts with Computer										
1.1.1. recognizes computer instructions	3	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.1.2. reads instructions, keyboard, output	3	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.1.3. uses control keys/commands	3	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.1.4. selects/uses written resources	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.1.5. experiments as a user	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.1.6. responds to error messages	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.2. Identifies Computer Rules										
1.2.1. rationalizes information processing	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.2.2. determines structural components	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.2.3. sequences process steps	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.2.4. recognizes computer processes	12	░	░	░	░	░	▨	▨	▨	▨
1.3. Explains Algorithm/Flowchart										
1.3.1. interprets	8	▨	▨	▨	▨		▨	▨	▨	
1.3.2. generalizes uses	8	▨	▨	▨	▨		▨	▨	▨	
1.3.3. discusses applications	8	▨	▨	▨	▨		▨	▨	▨	
1.4. Identifies Methods of Communication w/Computer										
1.4.1. recognizes programming languages	8	▨	▨	▨	▨	▨	▨	▨	▨	▨

░ concept, skill introduced

▨ concept, skill expectation reached and reinforced

	Bench-mark Grade	Entry Level	GRADES 9-11				GRADE 12			
			Lang. Arts	Math	Science	Soc. Studies	Lang. Arts	Math	Science	Soc. Studies
1.4.2. operates with words/symbols	8	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.5. Develops Positive Attitudes/Behaviors										
1.5.1. seeks work/play with computer	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
1.5.2. uses positive affect words	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
2. Problem Solving/Decision Making										
2.1. Uses Computerized Information Systems										
2.1.1. uses computer in decision making	12	░	░	░	░	░	▨	▨	▨	▨
2.1.2. creates program from flowchart	8	▨		▨	▨			▨	▨	
2.1.3. develops algorithm for problem solving	12	░		░	░			▨	▨	
2.1.4. describes problem solving/decision making process	12	░	░	░	░	░	▨	▨	▨	▨
3. Functions/Impact										
3.1. Identifies/Describes Computer Operations										
3.1.1. identifies input/output peripherals	3	▨		▨	▨			▨	▨	
3.1.2. describes functions of input, output and processing	6	▨		▨	▨			▨	▨	
3.2. Recognizes Computer Applications										
3.2.1. identifies applications	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
3.3. Recognizes Impact on Daily Life										
3.3.1. values efficient information processing	12	░	░	░	░	░	▨	▨	▨	▨
3.3.2. understands pro/cons of routine tasks	12	░	░	░	░	░	▨	▨	▨	▨

░ concept, skill introduced

▨ concept, skill expectation reached and reinforced

	Bench-mark Grade	Entry Level	GRADES 9-11				GRADE 12			
			Lang. Arts	Math	Science	Soc. Studies	Lang. Arts	Math	Science	Soc. Studies
3.3.3. appreciates economic benefits	12	░				░				▨
3.3.4. values communication/information	12	░	░			░	▨			▨
3.3.5. understands effects on economics, politics, crime	12	░				░				▨
3.3.6. identifies applications of computer science	12	░		░	░	░		▨	▨	▨
3.4. Differentiates Science/Technology										
3.4.1. knows evolution of electronic technology	6	▨		▨	▨	▨		▨	▨	▨
4. Limitations/Usefulness										
4.1. Recognizes Disadvantages										
4.1.1. lists limitations	8	▨	▨	▨	▨	▨	▨	▨	▨	▨
4.2. Identifies Major Applications										
4.2.1. describes how computers assist people	8	▨	▨	▨	▨	▨	▨	▨	▨	▨
5. Education/Career Opportunities										
5.1. Recognizes Support/Technical/Scientific Careers										
5.1.1. identifies local services/personnel	3	▨	▨	▨	▨	▨	▨	▨	▨	▨
5.1.2. identifies national/international careers	6	▨	▨	▨	▨	▨	▨	▨	▨	▨
5.2. Recognizes Opportunities for Integrating Computers in Other Careers										
5.2.1. compares educational requirements/opportunities	8	▨	▨	▨	▨	▨	▨	▨	▨	▨

ACTIVITIES

ACTIVITIES

Activity Guidelines

Sample Activities. The suggested sample activities on the following pages support the goals, objectives and student expectations of the Taxonomy. These activities provide teaching strategies for introducing certain concepts or developing specific skills in exploratory computer literacy. They are not intended to be the only method of presentation but are instead "starting points" from which teachers can expand into their own approaches, using their own ideas and creativity.

Subject. The sample activities in the first category of Entry Level take into consideration two major concerns: generic activities that are appropriate (usually) to any of the subject areas; introductory activities that are meant to serve as a means to help students, inexperienced with computers, in grades 9-12 quickly reach the student expectations set for grades 3, 6 and 8. Therefore, these activities are precursors to those found in the subject areas of language arts, mathematics, science and social studies. See the Exploratory Computer Literacy Curriculum Guide, Grades 7-8 for specific Entry Level activities that introduce the workings of a computer and the computer keyboard or other activities that relate to computer evolution and introductory graphics.

Student Expectations. The student expectations listed for each sample activity are written in condensed phrases. For further details, refer to the Taxonomy of Goals, Objectives and Student Expectations for Exploratory Computer Literacy in the section titled Curriculum Guidelines. Some of the student expectations will be introduced in the various activities, while others will be reinforced, having been initiated at an earlier grade level. The Scope and Sequence Chart, in the same section as mentioned above, illustrates where, when and how these student expectations are best considered.

Instructional Mode. The major mode or method of instruction is indicated for each activity. Some activities suggest more than one mode. It is at the discretion of the teacher as to what modes seem most appropriate for his or her circumstances. Refer to the discussion on these modes in the section titled Curriculum Description.

Prerequisites. Many of the sample activities expect a certain level of experience from the students. In several cases, a reference is made to other activities from Entry Level that would be worthwhile considering first. A few sample activities require a specific unit of study within a subject area to be in progress.

Classroom Management. The concerns for classroom management, found in the sample activities, include the number of microcomputers available to the teacher and the location of these machines. A microcomputer for classroom demonstration purposes should have one or two large monitors or several smaller monitors distributed throughout the classroom for visibility to all students. If two to four microcomputers are available in the classroom, a schedule for computer time should be established. Students must first plan their project or assignment on paper, check out their preparations with the teacher, and upon approval sign up for a designated block of computer time. Other desk assignments, related to the subject area or computer literacy, must be provided to involve all students in something constructive while waiting for their computer time.

With a computer lab setting, which is recommended, the teacher may need two to three assistants to either maintain order in the classroom while he or she is in the lab or to help out in the lab while he or she remains in the classroom. Although volunteer help from parents, colleagues or student-teachers is a convenient solution, it may not be all that reliable for any length of time. A more realistic approach would be to train two to three students in each class who are more "computer literate" and willing to take on special responsibilities to help you. (Rewards could include bonus points, extra computer time or the additional knowledge and experience gained by this opportunity.)

It is suggested that at least two assistants be in the lab while the teacher is not there, so one can contact the teacher in his or her classroom for any concerns that arise. As with computers in a classroom, there should be a requirement for students to prepare their exercise on paper, have it approved and then sign up for a block of computer time. A second block of time should only be granted to a student after all others have had their turns.

Materials. A number of resources (with specific page numbers) are suggested as possible background reading for the teacher and text material for students. It should be clarified that the frequent references to Spotlight on Computer Literacy by Ellen Richman are for the 1985 edition, which has rearranged some of the chapters from earlier editions. As the material is geared toward Apple equipment, some adjustments may be needed in the activities for other brands of microcomputers. Materials written for other brands of computers are included in the Teacher References located in the Resources section.

Time for Activity. Only an approximate time period for each activity can be suggested, since numerous variables, such as, number and location of available microcomputers, number of students, range of computer skills among the students, length of classroom period and other classwork assigned, are involved.

Teacher Preparation. Implementing the Exploratory Computer Literacy Guide, Grades 9-12 does require the teacher to plan in advance. Orders for particular software can take from one to two months. It is important to run through an entire tutorial program or experiment with a tool or utility program (as word processing) prior to any classroom activity with it. Keeping an eye out for current articles related to computer literacy will prove most helpful. Continual learning is an inherent part of teaching any subject, including computer literacy.

SAMPLE ACTIVITIES
ENTRY LEVEL

SAMPLE ACTIVITY #1
Interviewing People in Computer Careers

Subject:

Career Education can be offered in any subject area.

Student Expectation(s):

3.3.3. Appreciates economic benefits
3.3.6. Identifies applications of computer science
5.1.1. Identifies local services/personnel
5.1.2. Identifies national/international careers
5.2.1. Compares educational requirements/opportunities

Instructional Mode:

Topic

Prerequisite(s):

None

Classroom Management:

No computer is required. Students should work independently.

Material(s):

Resources for reference or text, such as:
Spotlight on Computer Literacy by Ellen Richman, Chapter 13;
Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter VII;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, Chapter 13;
Computers Today by Donald H. Sanders, pages 583-587.

Time for Activity:

Two or three class periods with a time interval for independent research.

Teacher Preparation:

Read in advance some background information from resources such as given above.

1. Before discussing computer careers or having students read any material pertaining to this area, ask students to list the first ten jobs that come to mind within a couple of minutes and checkmark the ones that might involve the use of a computer. Then compare lists and tabulate those jobs or careers that involve computers. Include computer specialists (programmers, system analysts, software developers, etc.)

and non-computer specialists (teachers, engineers, secretaries, etc.)

2. Have students select one of the listed jobs to research. Ask them to interview (in person or by phone) a person in that particular computer-related position and obtain information about job responsibilities, the role of the computer in his or her job, a typical day, the best-liked and least-liked aspects of his or her work. A sheet of questions with space for answers should be prepared before the interview.

3. Have students contact employment agencies, colleges and universities for data on the particular jobs they are researching. Ask them to investigate job descriptions, the average salary and the courses or degrees required. Suggest they make use of the Computer Careers Handbook, an ARCO Pubilcation, by Connie Winkler, found in the vocational department in most large libraries. Also, the Readers' Guide to Periodical Literature may prove to be helpful.

4. Allow time for students to share their research findings orally and to assemble their data on a bulletin board, along with advertisements, articles, want ads or other related resources.

SAMPLE ACTIVITY #2
Computer Impact on Society

Subject:

This topic, part of Career Education, can be offered in any subject area.

Student Expectation(s):

4.1.1. Lists limitations of computers
4.2.1. Describes how computers assist people

Instructional Mode:

Topic

Prerequisite(s):

General Education Sample Activity #1 - Computer Careers or something comparable.

Classroom Management:

No computer is required. Students could work independently or in pairs prior to the group discussion.

Material(s):

Film projector and 16 mm film, "And What of the Future?".
Resources for reference or text, such as:
Computer Literacy--Programming, Problem-Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, Chapter 9;
Computers Today by Donald H. Sanders, Chapter 19;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, Unit 5.

Time for Activity:

Two class periods; one for showing the film and one for a follow-up discussion session.

Teacher Preparation:

Attempt to preview the film, if possible, to select specific areas for special attention by students.

1. Introduce the film with a handout sheet of questions which could include:

   a. List three limitations of using computers;
   b. List three benefits from using computers;

   c. Give an example of a benefit and a problem from using computers for the Washington, D.C. Metro (subway), at a Dallas supermarket and in a Scottish hospital.
   d. What types of jobs do robots perform and how will they be used in the future?

2. Show the film and allow time afterward for students to complete the handout.

3. Have students read some material on automation and the job market from resources such as given above. Additional questions could be assigned.

4. Discuss questions from the film and the reading. Consider jobs lost to automation, jobs created by automation, how jobs outside the computer industry have been affected, future trends and the impact on career choices.

5. Ask students to be "on the lookout for" newspaper articles relating to the impact of computers on society and jobs and bring these clippings in for sharing and posting.

SAMPLE ACTIVITY #3
Using the INPUT Statement in BASIC

Subject:

Programming is best suited to the subject areas of Mathematics and Science.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should know how to operate the microcomputer and have had some introductory work with the BASIC statements of REM, PRINT, LET, END.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstrations there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary.
 Because of variations in BASIC, certain modifications of the programming activities may be necessary. Check your user's manual for modifications.
Resources for reference or text, such as:
 Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, pages 186-195;
 Spotlight on Computer Literacy by Ellen Richman, Chapter 19;
 Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 58-60;
 Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, Chapter XIII;
 Computers Today by Donald H. Sanders, pages 408-414.

Time for Activity:

Two class periods.

Teacher Preparation:

Review any of the references suggested above or other related articles on BASIC Input/Output techniques.

1. Review with students how to get information in and out of a program using the PRINT statement. Introduce the two other methods for getting information in and out of a program:

   READ and DATA statements and the INPUT statement.

   Run the following simple examples for demonstration purposes.

```
NEW
10  REM    TESTING READ-DATA STATEMENTS
20  READ   A, B, C
30  DATA   39, 48, 57
40  PRINT  A, B, C
50  END
```

   Indicate that more work will be done later on READ and DATA statements.

```
NEW
10  REM    TESTING INPUT STATEMENT
20  PRINT  "ENTER THREE NUMBERS."
30  INPUT  A, B, C
40  PRINT  A, B, C
50  END
```

   Emphasize the interaction between the computer and the user when using INPUT statements.

2. Be sure to review (or introduce) the use of numeric variables (A, B, etc.) versus string variables (A$, B$, etc.)

```
NEW
10  REM    TESTING READ-DATA STRINGS
20  READ   A$, B$, C
30  DATA   MARY JONES, AL SMITH, 1461
40  PRINT  A$, B$, C
50  END
```

```
NEW
10  REM    TESTING INPUT STRINGS
20  PRINT  "WHAT IS YOUR NAME, PLEASE?"
30  INPUT  N$
40  PRINT  "HELLO "; N$
50  END
```

3. Have students as a group devise a program that outputs a letter on the screen to a gardener. The letter should describe some problems that a classmate's garden has. Only PRINT and INPUT statements must be used.

An example follows:

```
10  PRINT  "WHAT'S YOUR NAME?"
20  INPUT  N$
30  PRINT  "HOW OLD ARE YOU?"
40  INPUT  A
50  PRINT  "NAME A BIRD."
60  INPUT  B$
70  PRINT  "NAME A TREE."
80  INPUT  T$
90  PRINT  "NAME AN INSECT (PLURAL)."
100 INPUT  I$
110 PRINT  "NAME AN ANGULAR GEOMETRIC SHAPE."
120 INPUT  G$
130 PRINT  "NAME YOUR FAVORITE FLOWER (PLURAL)."
140 INPUT  F$
150 PRINT  "NAME YOUR FAVORITE FRUIT (PLURAL)."
160 INPUT  R$
170 PRINT  "NAME YOUR FAVORITE VEGETABLE (PLURAL)."
180 INPUT  V$
190 PRINT  "NAME YOUR FAVORITE COLOR."
200 INPUT  C$
210 PRINT  "FINALLY, GIVE THE FULL NAME OF A CELEBRITY."
220 INPUT  P$
230 PRINT  "DEAR GARDENER,"
240 PRINT  "      MY GARDEN NEEDS HELP."
250 PRINT  "THE WEEDS ARE "; A; " INCHES HIGH."
260 PRINT  "THE TOMATO PLANTS ARE GROWING "; G$; " TOMATOES"
270 PRINT  "AND THE ONIONS ARE PRODUCING "; F$; "."
280 PRINT  I$; " ARE DESTROYING THE LETTUCE"
290 PRINT  "AND MY PET "; B$; " IS BUILDING"
300 PRINT  "A NEST INSIDE THE SQUASH."
310 PRINT  "      THE BEETS ARE TURNING "; C$
320 PRINT  "AND THE CARROT TOPS LOOK LIKE "; T$; " TREES."
330 PRINT  "THE RADISHES ARE BEARING "; R$
340 PRINT  "AND FINALLY, MY PRIDE AND JOY "; V$
350 PRINT  "HAVE LEFT MY YARD AND ARE"
360 PRINT  "GROWING IN "; P$; "'S GARDEN."
370 PRINT  "      PLEASE ADVISE."
380 PRINT  "           SINCERELY,"
390 PRINT  "           "; N$
400 END
```

Ask students to take note of the use of semicolons in PRINT statements and of the use of spaces at the beginning and end of quotes to prevent words in the text from running into words or numbers represented by variables.

While running the program, draw boxes on the chalkboard, each with a label of a variable from the above program. As students give their responses, write them in the appropriate box to help keep tract of input variables.

4. Have students work in pairs on the following assignments:

   a. Think of a short story that has four or five key words that can be stored as variables (their values can vary). Then ask four or five questions with PRINT statements, each followed by an INPUT statement to store the answer. Finally, use some PRINT statements to write your "story." Use the variables in place of those key words. After designing their programs on paper, allow the pairs of students to try out their programs at the microcomputers on a rotational basis.
   b. Using INPUT statements, write a program that makes the computer print the area of any triangle, given the base and height of the triangle. (Area = ½*base*height); try areas of other geometric shapes.
   c. Using INPUT statements, write a program that will allow you to input the number of hours you watched TV last night. Have the computer print the total number of hours and the equivalent number of days you will watch TV in a year at that rate.

5. Show students how to save their programs on an initialized data disk, so they may test their interactive programs on others.

6. If your microcomputers accept the condensed version, show students the shortcut for combining the PRINT and INPUT statements:

```
INPUT "HELLO, WHAT IS YOUR NAME?"; N$
```

SAMPLE ACTIVITY #4
Using the IF-THEN Statement in BASIC

Subject:

Programming is best suited to the subject areas of Mathematics and Science.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.3.1. Interprets a simple algorithm/flowchart
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
2.1.2. Creates program from flowchart
2.1.3. Develops algorithm for problem solving

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should be comfortable with operating the microcomputer and have background in BASIC, using the REM, PRINT, LET, GOTO, INPUT, END statements. Entry Level Sample Activity #3 is recommended prior to this.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstrations there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary.
Because of variations in BASIC, certain modifications of the programming activities may be necessary. Check your user's manual for modifications.
Resources for reference or text, such as:
Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, pages 247-256;
Spotlight on Computer Literacy by Ellen Richman, Chapter 20;
Scholastic Computing--An Introduction to Computers by Jack L. Roberts, pages 125-128;
Computer Literacy--Problem- Solving with Computers by C. E. Horn and J. L. Poirot, pages 247-249.

Time for Activity:

Two to three class periods, depending on the number of microcomputers available.

Teacher Preparation:

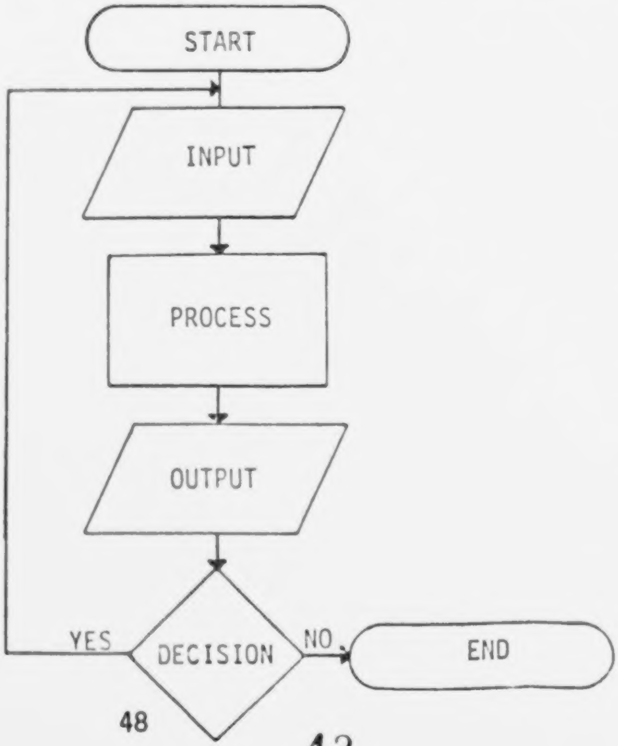
Review any of the references suggested above or other related articles on BASIC IF-THEN decision statements and flowcharting techniques. Prepare a demonstration disk.

1. Using a large demonstration monitor, introduce the IF-THEN statement by running a short program saved on disk, such as the following:

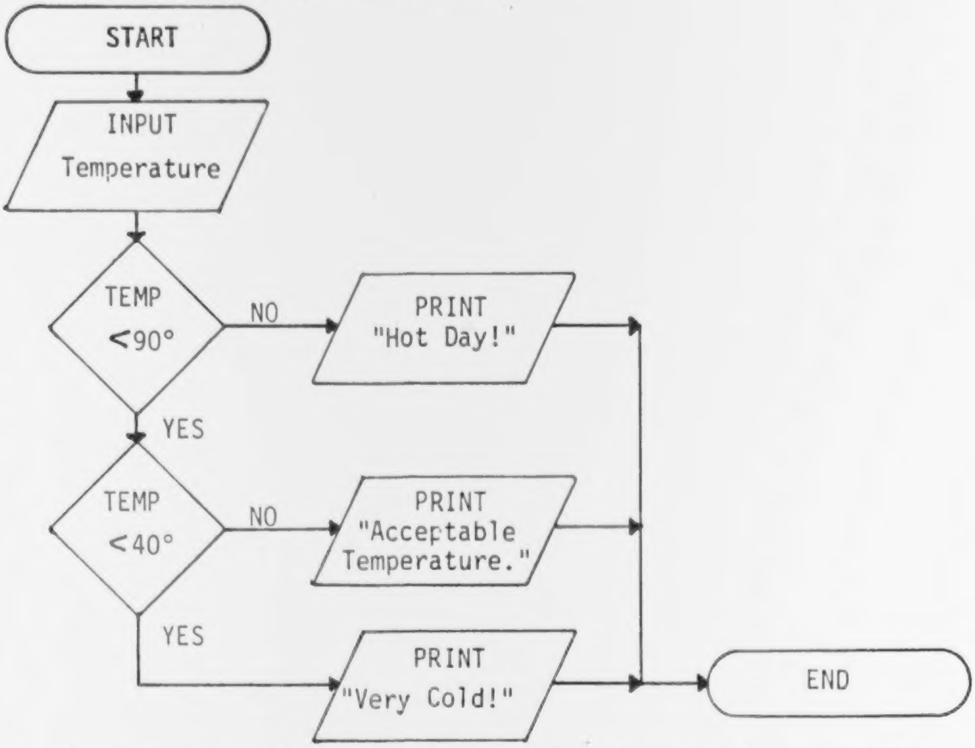
```
10  REM    INTRODUCING IF-THEN STATEMENTS
20  PRINT  "WHICH WOULD YOU RATHER RIDE, A CAMEL OR A CROCODILE?"
30  INPUT  A$
40  IF A$  = "CAMEL" THEN GOTO 70
50  IF A$  = "CROCODILE" THEN GOTO 90
60  IF A$  = "NEITHER" THEN GOTO 110
70  PRINT  "YOU PICKED A MAMMAL!"
80  GOTO   120
90  PRINT  "YOU PICKED A REPTILE!"
100 GOTO   120
110 PRINT  "YOU'RE NOT VERY DARING!"
120 END
```

2. Interpret the computer's "intelligence" by discussing conditional statements, which are used when you want the computer to make a decision; to do one thing if a condition is true and another thing if the condition is not true. List the above program to show the IF-THEN statements.

3. Review or introduce flowcharting and the basic symbols, which are used to draw steps in solving a problem. Show how the diamond is used when a decision is to made. The following flowchart represents standard processing of data.



4. Provide a flowchart for students to follow and interpret into a BASIC program. The following is a possibility.



Have students suggest the coding for you to enter or select a student to key in this program for the class to see.

5. Assign problems for students to solve using IF-THEN statements. Have students work in pairs to develop a flowchart prior to coding. Allow students to key in their programs and save the programs on disk. Provide lab time on a rotational basis. Examples for problems are:

   a. Write a computer quiz having five questions. Think of each question and possible answers before you include it in the flowchart.

   b. As cashier at Kidsworld Amusement Park, it is your job to sell tickets to those entering the park. There are five categories of tickets:

Age	Price
5 and under	free
6-11	$1.00
12-16	$3.00
17-60	$4.00
over 60	$2.00

Prepare a flowchart and write a program that allows you to type in the age of the customer. The computer will determine and print out the cost of the ticket to be sold to that individual.

c. Using IF-THEN statements and a counter, write ten multiple-choice multiplication questions. Show at the end how many were answered right or wrong. This problem is best suited to students who are more experienced with the BASIC language. However, most students with the prerequisites for this activity, could handle this.

SAMPLE ACTIVITY #5
Using the FOR-NEXT Statement in BASIC

Subject:

Programming is best suited to the subject areas of Mathematics and Science.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.3.1. Interprets a simple algorithm/flowchart
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.2. Creates program from flowchart

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should be comfortable with operating the microcomputer and have background in BASIC, using the REM, PRINT, LET, GOTO, INPUT, IF-THEN, END statements. Prior flowcharting experience is suggested. Entry Level Sample Activities #3 and #4 are good precursors to this activity.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstration there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary.
Because of variations in BASIC, certain modifications of the programming activities may be necessary. Check you user's manual for modifications.
Resources for reference or text, such as:
- Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, pages 289-301;
- Spotlight on Computer Literacy by Ellen Richman, Chapter 22,
- Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, pages 250-251;
- Computers Today by Donal H. Sanders, pages 424-426;
- Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, page 88-89;
- BASIC Discoveries by Linda Malone and Jerry Johnson, pages 43-48.

Time for Activity:

Two to four class periods, depending on the number of microcomputers available.

Teacher Preparation:

Review any of the references suggested above or other related articles on BASIC FOR-NEXT statements and looping structures.

1. Introduce the FOR-NEXT statements by keying in and running a short counting program on the demonstration microcomputer:

```
NEW
10  REM    JUST COUNTING
20  FOR    N = 1 TO 5
30  PRINT  N
40  NEXT   N
50  END
```

2. Explain that the FOR-NEXT statements provide a counting loop, and a loop is a series of statements that is repeated. With the FOR command the user directs the computer to start a variable at one number and keep counting until it reaches another number. The NEXT command directs the computer to go to the next number in the counting sequence. In between the FOR and NEXT statements the user can put other statements that will be repeated. Contrast FOR-NEXT with IF-THEN statements.

3. Present other short programs, using the FOR-NEXT statements; include the STEP command; and have students suggest some examples. Here are a few:

```
NEW
10  REM    CHECKING STEP COMMAND
20  FOR    X = 2 TO 10 STEP 2
30  PRINT  X
40  NEXT   X
50  END

NEW
10  REM    BLINK BLINK
20  FOR    N = 1 TO 10
30  PRINT  "BLINK"
40  REM    A WAITING LOOP
50  FOR    M = 1 TO 100
60  NEXT   M
70  NEXT   N
80  END

NEW
10  REM    CHECKING INPUT COMMAND
20  PRINT  "ENTER A NUMBER FROM 1 TO 25."
30  INPUT  S
40  FOR    N = 63 TO 115 STEP S
```

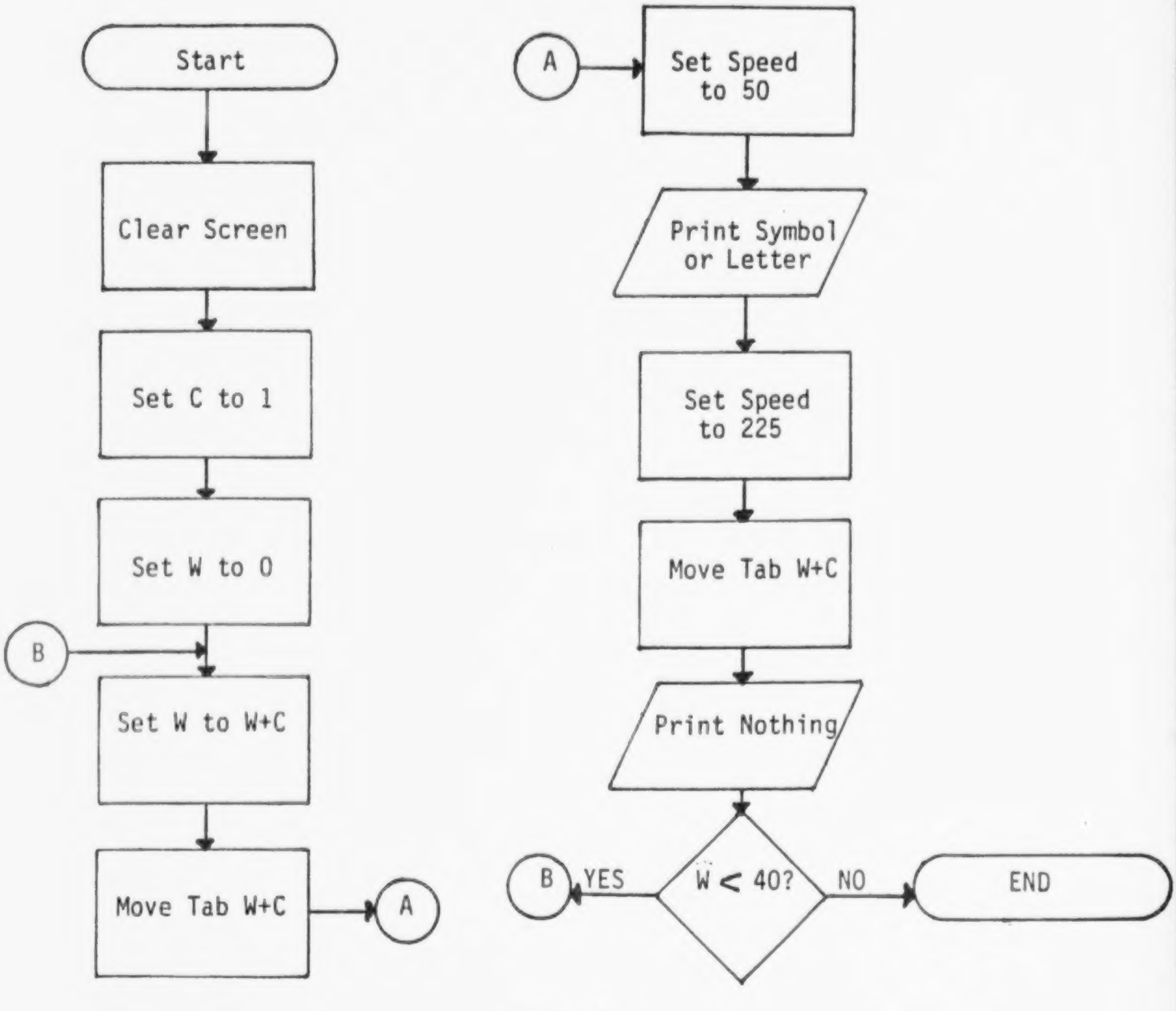
47

```
50  PRINT  "N IS "; N
60  NEXT   N
70  END
```

4. Clarify that GOTO or IF-THEN statements should not be used within a FOR-NEXT loop to transfer to a different statement number.

5. Assign a FOR-NEXT problem for students to explore in pairs. The suggested exercise here is to serve not only as a means to practice the new command but also as a precursor to Graphics. It requests students to animate some symbol or letter in text-mode (for the Apple). Introduce the HTAB command, (for horizontal tabulation) and the SPEED command.

   a. Make a symbol or letter move across the screen from left to right.
   b. Interpret the flowchart and code the program two different ways. For one version use the more familiar IF-THEN command. For the second version use the new FOR-NEXT command.



c. The two versions could look like the following:

```
NEW
10  HOME
20  LET    C = 1
30  LET    W = 0
40  LET    W = W + C
50  HTAB   W + C
60  SPEED  = 50
70  PRINT  "#";
80  SPEED  = 225
90  HTAB   W + C
100 PRINT  " ";
110 IF     W < 39 THEN GOTO 40
120 END
```

```
NEW
10  HOME
20  LET    C = 1
30  FOR    W = 1 TO 39
40  HTAB   W + C
50  SPEED  = 50
60  PRINT  "#";
70  SPEED  = 225
80  HTAB   W + C
90  PRINT  " ";
100 NEXT   W
110 END
```

d. Have students print out their listings and save their programs on diskettes. These can be shown during the follow-up discussion. Have two students load and run their programs on the demo microcomputer, contrasting the two approaches to this problem.

SAMPLE ACTIVITY #6
Beginning Use of Word Processor

Subject:

Language Arts is most appropriate.

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic/Tutor

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstrations there should be one microcomputer with a large monitor or two. One or two printers should be available. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printers.
Word processor software and manual, such as:
    AppleWriter, Milliken's Word Processor, Bank Street Writer, PFS: Write, Superscripsit, C64 - Wordprocessor, etc.
Blank diskettes.
Handout for demonstration and exercise.

Time for Activity:

Two or three class periods; one for the class demonstration and one or two for a work session.

Teacher Preparation:

Become familiar with the software program and accompanying manual. Initialize as many blank diskettes as there are teams of students. Prepare a demo file with a letter having errors. If possible, train one or two students as your assistants in demonstrations and as consultants to other students. A sample letter and assignment-paragraphs follow this activity.

1. Explain what a word processor is and discuss the advantages over a typewriter.

2. Distribute the handouts which briefly summarize the major aspects of the particular word processor the class will be using. Follow the procedure in the handout for the demonstration. Have a student assistant (whom you have "prepped" earlier) operate the computer while you talk through the demonstration.

   a. Show how to load the program.
   b. From the main editor menu, load the tutorial file. Explain that the editor menu provides an overview of the kinds of things you can do with the word processor.
   c. Go through the tutorial with the class explaining points where necessary.
   d. Load the demo file and make some editing changes where needed, eliciting suggestions from students; have the assistant key in the changes that the class requests. Show how to save the file.
   e. Print the demo letter that has been edited. Talk about the print menu selections needed to get a double-spaced printout on your printer.

3. Assign students an exercise to key in with the original errors, as provided in the same handout. Let them work in pairs. Have them circle the errors and plan their editing strategies prior to their turn in the lab. When they have finished editing, have students save the new file and print it out.

4. Following the work session, have students compare their printouts and discuss any problems or concerns.

SAMPLE LETTER
for Word Processing

dear MR. Sakuda:

In behaff of all mebmers of the DO GOODERS'   CLUB, I would like to think you for atending ourmeeting on may 3, 1985. Your presentation on the City Parks and Recration Department was most informitive We now had better insight as to how our grup migh contribute time and effort   in the tre plantting pro-gram.

We look foreward to hearing from you. Do letus know teh exact date an time we should meet to began the planting session at Sparse Tree Park.

Sincerly;

Ms.Adams

Have students help you locate the errors while you demonstrate how the word processor is used to make the corrections. Show how the second to the last sentence can be moved to the last sentence position.

EXERCISE
for Word Processing

Perahps the fist calculating machine that can be truly called a computer was invented in england by Charles Babbage in 1835. Babbage"s dream was to built a machine that could do more than calculate big number. It would recieve instructions. It would process and store information. it would print theresults. he planed to call it the Anylytical Engine. Babbage plan to use punch cards for the numericle informationHe also planned to print out the results.

Babbage was a respected scientist, but most people could not understand his new and unusaul ideas. he was called 'eccentric." He has a hard time funding anyone who wuold lent him money to build the Analytical Engine. However, a gifted mathemitician, Lady Ada Augusta Lovelace, saw that the Analytical Engine could be an important machine. She suported Babbage in trying to raise money to built it. One of her most important contributions was to connvince Babbage to use the binary number system in his machine, instead of the decimal nubmer system. Using binary numbers would made the Analytical Engine work more eficiently. Babbage died thanking himself a failure.

Ada Augusta Lovelace also wrot about Babbage's plans for the Analytical Engine. from these writings, it is clear that his planes were for those of a modern computer system: input, Output, memory, and central proccesing unite.

Unfortunutly, Ada Augusta Lovelace was the only person who apreciated Babbage's plans. Lack of money hold up progress. Lack of precision tools made it very hard for Babbage to work on the Analytical Engine.In the erly 1800s, electricity is not used. There were only mechanical tools to work with, such as gears, cogs, and wheels? The tools of Babbage's time was just not precise enuff to build this complocated machine. The Analytical Engine never worked. He never knew his idears would be used more than 100 years latter in the first "modern" computer.

Have students key in these paragraphs with all the errors. Then they are to make corrections with the word processor, according to their previous planning. Have them move the last sentence in the second paragraph to a more appropriate spot.

SAMPLE ACTIVITIES
LANGUAGE ARTS

SAMPLE ACTIVITY #1
A Community Novel and the Word Processor

Subject:

Language Arts

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should have already had experience with word processing and an introduction to this particular word processor software. If an introductory activity is needed, refer to Entry Level Sample Activity #6 - Beginning Use of Word Processor.

Classroom Management:

One student per computer is recommended. A lab setting is best with a minimum of five microcomputers and one or two printers. Refer to Activity Guidelines, page 35, on scheduling students for labwork.

Material(s):

Microcomputers and printers.
Word processing software and manual, such as:
    AppleWriter, Milliken's Word Processor, Bank Street Writer, PFS: Write, Superscripsit, C64 - Wordprocessor, etc.
Blank diskettes for students files.

Time for Activity:

One to two week period, depending on the number of microcomputers available and other assignments for students to complete.

Teacher Preparation:

If you are concerned about uniting your creative writing group while encouraging each member to work independently and at the same time cultivating students' word processing skills, this activity will help meet all these needs. Prepare ideas for the story.

1. Present to the class an outline for a mystery or adventure story that includes the plot, setting, time frame, chapter scenarios and main characters. Explain that the class is to write a novel, not as a group but as independent authors writing and editing individual chapters.

2. Assign one chapter to every member of class. Tell each one when and where they are to pick up and leave off the main characters. These are the rules:

    a. If an individual author introduces any characters during the course of the chapter, he/she must drop them out before the end of the chapter.
    b. The author may do anything he/she wishes to the main characters during the chapter, but he/she must leave them whole and unharmed by the end of the chapter.
    c. Each author must stay within the established time frame and setting requirements.
    d. Authors must not collaborate with each other during the writing phase of the book.

3. Require each student to use the word processor to write and rewrite as needed and print a final copy. Lab sign up times and procedures must be followed.

4. Have students compile the chapters into a book and provide copies for all authors. Students versed in Logo graphics or BASIC graphics might illustrate the chapters.

SAMPLE ACTIVITY #2
Software Analysis

Subject:

Language Arts

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.1.2. Reads instructions, keyboard, output
1.1.3. Uses control keys/commands
1.1.4. Selects/Uses written resources
1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
3.3.4. Values communication/information
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Topic/Tutor

Prerequisite(s):

Students should be comfortable with using the microcomputer. They must have experienced the computer as a Tutor from running a software package. (This could be a drill and practice program or a tutorial or simulation program in English or other subject areas.)

Classroom Management:

Two students per computer is recommended. A lab setting with five or more microcomputers is best, however, three to four microcomputers in the classroom will do. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Numerous recent software catalogs (and software review reports, if possible).
Blank software evaluation forms.
Microcomputers; enough software packages for every pair of students. The software to be evaluated by students should be included in the catalogs, but can be for any grade level or subject area.

Time for Activity:

Three to five class periods, depending on the number of microcomputers available.

Teacher Preparation:

Prepare software evaluation forms for students. The standard form used by Computer Education in the Department of Education follows this activity. Assemble the needed catalogs (and published reviews, if available). Photocopy a page from a software catalog for student handouts.

1. Introduce this activity by taking a survey of students who have used computer software they consider either exceptionally good or extremely bad. Include in the discussion and record on the chalkboard:

   a. What features make a software program "good"?
   b. What features make a software program "bad"?
   c. What should educational software provide?

2. Distribute the handout showing a page from a software catalog advertising programs in a particular subject area, as Language Arts. Have students examine the information on the packages from the point of view of an educator planning to purchase some software. Consider the following questions in the ensuing discussion:

   a. Which program seems most interesting? Why?
   b. Are the descriptive summaries adequate for knowing what the programs are supposed to accomplish? What might be further included?
   c. Do we know the target grade levels? Should the type of student (e.g., remedial or gifted) be considered?
   d. Are there any technical terms that need clarifying?
   e. Is there sufficient information given about hardware requirements?

3. Have each pair of students select one software program with manual to run and evaluate. Hand out the evaluation form for them to use. Discuss the areas for observation and evaluation. Ask them to write down additional concerns from the previous discussion that they consider important in seeking "good" software for the particular grade level and subject area at hand. Have students include these on the evaluation form.

4. Request students to find their particular program in a software catalog; critique the descriptive summaries in writing; check the software review reports for any review of that program; and schedule themselves for computer time to evaluate the program for themselves.

5. When all pairs of students have completed their evaluations, have them share their analyses with the class. If they found a published review of their program, allow them to compare their findings with a professional's.

SOFTWARE EVALUATION FORM

TITLE:

SUBJECT:

LEVEL:

PUBLISHER

LIST PRICE:

HARDWARE REQUIREMENTS:

OPERATING SYSTEM:

	CONTENT:	Poor	Fair	Avg.	Good	Excellent
1	Accuracy	1	2	3	4	5
2	Educational Value	1	2	3	4	5
3	Freedom from stereotypes	1	2	3	4	5
	INSTRUCTIONAL QUALITY:					
4	Well-defined purpose	1	2	3	4	5
5	Achieves defined purposes	1	2	3	4	5
6	Clear, logical presentation	1	2	3	4	5
7	Appropriate difficulty	1	2	3	4	5
8	Appropriate use of graphics, color and sound	1	2	3	4	5
9	Motivational	1	2	3	4	5
10	Effective students involvement	1	2	3	4	5
11	Effective feedback	1	2	3	4	5
12	Easily used	1	2	3	4	5
13	Learning can be generalized	1	2	3	4	5
	TECHNICAL CHARACTERISTICS:					
14	Comprehensive documentation	1	2	3	4	5
15	Effective documentation	1	2	3	4	5
16	Effective information displays	1	2	3	4	5
17	Easily used	1	2	3	4	5
18	Appropriate use of computer Capabilities	1	2	3	4	5
19	Reliable in use	1	2	3	4	5
	OVERALL RATINGS:					
20	Content	1	2	3	4	5
21	Instructional quality	1	2	3	4	5
22	Technical characteristics	1	2	3	4	5
23	Final recommendation	1	2	3	4	5

(PLEASE TURN OVER)

STRENGTHS:

WEAKNESSES:

COMMENTS:

SAMPLE ACTIVITY #3
Designing a Data Base for Poetry

Subject:

Language Arts

Student Expectation(s):

1.2.1.	Rationalizes information processing
1.2.4.	Recognizes computer processes
1.5.1.	Seeks work/play with computer
1.5.2.	Uses positive affect words
2.1.1.	Uses computer in decision making
3.2.1.	Identifies applications
3.3.1.	Values efficient information processing
3.3.2.	Understands pros/cons of routine tasks
3.3.4.	Values communication/information
4.1.1.	Lists limitations
4.2.1.	Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. Poetry should be the current unit of study. Previous experience with word processing is highly recommended. See Entry Level Sample Activity #6 - Beginning Use of Word Processor or Sample Activity #1 in Language Arts - A Community Novel and the Word Processor.

Classroom Management:

One microcomputer with a large monitor or two should be used for the classroom demonstration. If two to four microcomputers are available, one student at a time can use a machine on a rotational basis. A lab setting with one or two printers is recommended. Refer to Activity Guidelines, page 35, on scheduling students for labwork.

Material(s):

PFS: File, published by Software Publishing Corporation, or some other program for storing and retrieving data.
Program user manual.
Microcomputers with two disk drives each.

Time for Activity:

One to two-week period, depending on the number of microcomputers available and whether or not word processing is to be integrated with this activity.

Teacher Preparation:

Spend a few hours experimenting with the program, to become familiar with its operation and documentation. The PFS: File program is part of an integrated system, using PFS: Graph and PFS: Write. If you desire to have students compose their writing on a word processor and store it on a data base for retrieval by their classmates, consider introducing word processing first.

After students have entered their poems on their data disks, be sure to combine their disks into one master disk for the classroom data base using the COPY function.

1. Review with the class the terms "data base" and "information retrieval." Distinguish the terms field, record and file in a data base. Refer to Appendix C for terms. (Illustrate these terms from this activity, such as: a field is TITLE or AUTHOR; a record is the whole format for a poem; the file is the collection of poems from the class.) Inform students that they will be creating a class data base for their poetry.

2. Demonstrate PFS: File (or similar software) and the procedure the students will follow in designing, entering, searching and updating the data base they are about to create. Show how and when to use the program disk and the data base disk.

3. Have students as a class suggest how their poetry data base should look. A possible format follows:

```
TITLE:        XXXXXXXXXXXXXXXXXX
AUTHOR:       XXXXXXXXXXXXXXXXXX
THEME:        XXXXXXXXXXXXXXXXXX
STYLE:        XXXXXXXXXXXXXXXXXX
# OF LINES:   NNN
DATE:         NN/NN/NN
TEXT:         XXXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXXX
              XXXXXXXXXXXXXXXXXX
```

4. Using the DESIGN function, either key in the format or have a volunteer student do so. Note that pressing CTRL and N will allow continuation to next page for more TEXT.

5. Clarify the need for entering all positions for the fixed-line numeric data for # OF LINES and DATE. If PFS: File is to compare values in numeric fields from two or more records, it needs leading zeroes entered when no value exists for that position. For example 05/01/85 for DATE and 009 for # OF LINES.

6. Request all students to enter their three most recent poems on the new data base; all data must be prepared on paper before getting on the computers.

   Or if the integrated PFS system is used, have students compose three poems with the PFS: Write program and then store them on the data base established by the PFS: File program. Signing up for computer time should be a prerequisite for using the equipment.

7. After all students have entered their poetry on the data base, discuss any problems or concerns that students may have related to "data basing." Show how they can search for and retrieve one or more poems by author, theme, style, date, etc.

   a. Discuss the advantages and disadvantages of their data base; does it bother some of them to have their private writings easily accessible to others?
   b. Elicit ideas from students for reasonable improvements of their data base.
   c. Ask students to continue adding their assigned poems to the data base; after a specified time span, have the class as a group analyze the style of selected individuals or compare the variety of poems on a particular theme. (This might be quite revealing.)

SAMPLE ACTIVITIES

MATHEMATICS

SAMPLE ACTIVITY #1
Binary Numbers

Subject:

Mathematics

Student Expectation(s):

1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.2.4. Recognizes computer processes

Intructional Modes:

Topic

Prerequisite(s):

None

Classroom Management:

No computer is required.

Material(s):

Resources for text, such as:
Spotlight on Computer Literacy by Ellen Richman, pages 32-34;
Computers Today by Donald H. Sanders, pages 116-121;
Computer- Literacy--Programming Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 38-41.
Overhead projector.
Prepared transparency for Binary Mind Reading game and blank transparencies.

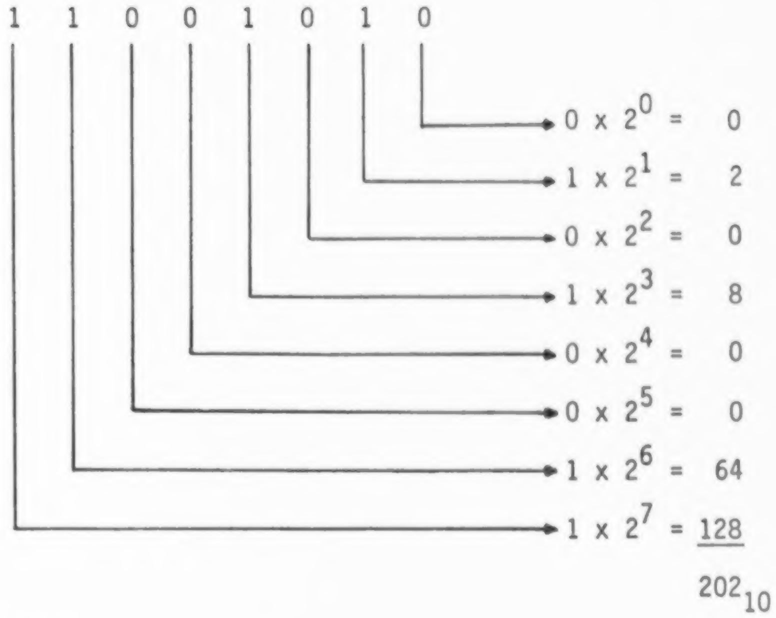
Time for Activity:

One class period.

Teacher Preparation:

Photocopy for students any needed information or illustrations from any of the above resources or other related articles. Prepare the overhead transparency on Binary Mind Reading. A "master" is provided at the end of this activity.

1. Briefly review (or introduce) numbering systems by comparing the decimal and the binary systems. Consider the more ancient additive approaches, (such as I, II, III, etc.), and the more modern positional approaches (such as ours). Include the role of the system's base, symbols, positions, and specific powers of the base. Illustrate both the decimal and binary systems on a blank transparency:



Binary number	1	1	0	0	1	0	1	0
Power of base	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Decimal equivalent	128	64	32	16	8	4	2	1

2. Relate computer circuitry to the binary system:

   a. 0 represents "off" and 1 represents "on";
   b. These two binary digits are called bits;
   c. The computer translates instructions into a series of bits;
   d. In most computers every letter, number and symbol is translated into eight bits, a combination of 0's and 1's, called collectively a byte.

3. Illustrate on an overhead transparency the BASIC instruction, PRINT "BOO"

Byte	Circuits							
	1	2	3	4	5	6	7	8
P 01010000	Off	On	Off	On	Off	Off	Off	Off
R 01010010	Off	On	Off	On	Off	Off	On	Off
I 01001001	Off	On	Off	Off	On	Off	Off	On
N 01001110	Off	On	Off	Off	On	On	On	Off
T 01010100	Off	On	Off	On	Off	On	Off	Off
" 00100010	Off	Off	On	Off	Off	Off	On	Off
B 01000010	Off	On	Off	Off	Off	Off	On	Off
O 01001111	Off	On	Off	Off	On	On	On	On
O 01001111	Off	On	Off	Off	On	On	On	On
" 00100010	Off	Off	On	Off	Off	Off	On	Off

4. Have students practice converting some of the above bytes from the binary system into the decimal.

5. For fun and reinforcement, present the following Binary Mind Reading game.

   a. Have transparency prepared with the following:

15	15	15	15
14	14	14	13
13	13	11	11
12	12	10	9
11	7	7	7
10	6	6	5
9	5	3	3
8	4	2	1
D	C	B	A
2^3	2^2	2^1	2^0

   b. Lead the guessing game by asking a student to pick a number from 1 to 15. Without telling the teacher what the number is, the student should respond to questions from the teacher regarding which column the chosen number is in.

   c. Suppose the student picks the number 13. Ask the following questions: 1) Is the number in column A? Answer: Yes. (Teacher thinks 1x1)
   2) Is the number in column B? Answer: No. (Teacher thinks 0x2)
   3) Is the number in column C? Answer: Yes. (Teacher thinks 1x4)
   4) Is the number in column D? Answer: Yes. (Teacher thinks 1x8)
   Since (1x1)+(0x2)+(1x4)+(1x8) = 13, you can accurately guess that the student's number is 13.

   d. After several such interactions between you and the class, some students may have discovered the algorithm being used. If so, let those students assume the role of the teacher and guess the mystery numbers.

   e. Now have students record on paper, from right to left, a one or a zero, based on whether the answer for listing in each column is yes or no. Example: Students picks the number 12. Teacher (or another student) asks:
   1) Is it in column A? Answer: No. Record a 0
   2) Is it in column B? Answer: No. Record a 0
   3) Is it in column C? Answer: Yes. Record a 1
   4) Is it in column D? Answer: Yes. Record a 1
   Since 12 (base ten) = 1100 (base two), the mystery number is 12.

BINARY MIND READING GAME

15	15	15	15
14	14	14	13
13	13	11	11
12	12	10	9
11	7	7	7
10	6	6	5
9	5	3	3
8	4	2	1
D	C	B	A
2^3	2^2	2^1	2^0

SAMPLE ACTIVITY #2
Mystery Flowchart

Subject:

Mathematics

Student Expectation(s):

1.3.1. Interprets algorithm/flowchart
1.3.2. Generalizes uses of algorithm/flowchart
1.3.3. Discusses applications of algorithms/flowcharts
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
2.1.2. Creates program from flowchart

Instructional Mode:

Tutee

Prerequisite(s):

Students should have had an introduction to flowcharting and be familiar with the INPUT and IF-THEN statements in BASIC. See Entry Level Sample Activities #3 and #4.

Classroom Management:

Students should work independently. A computer lab setting is recommended but not necessary.

Material(s):

Microcomputers and system master disks or BASIC disks, if necessary. Chalkboard with flowchart.

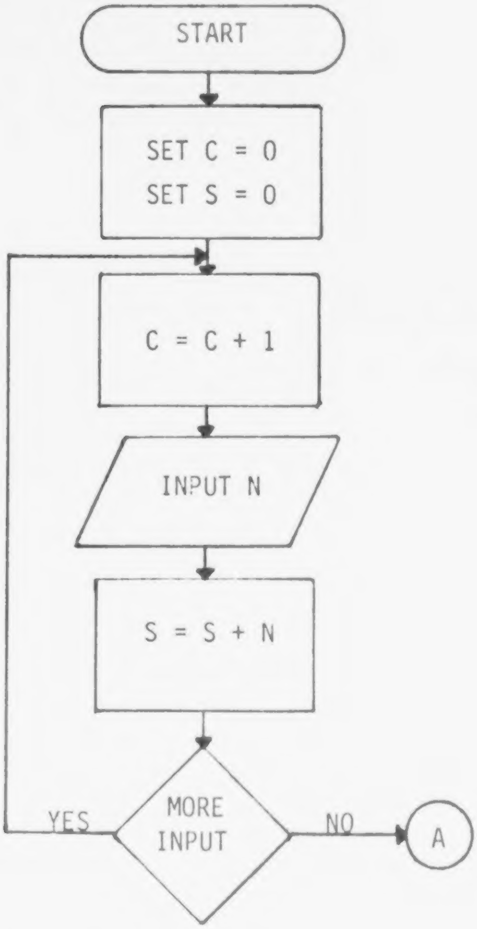
Time for Activity:

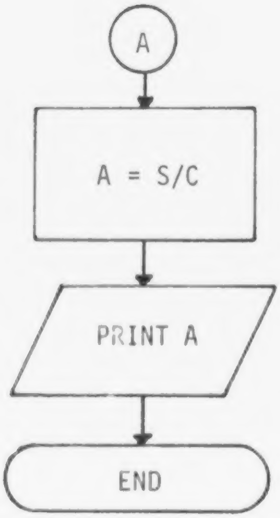
One to two class periods, depending on the number of microcomputers available and other assignments given in mathematics.

Teacher Preparation:

Code the program in BASIC and try it out in advance.

1. On the chalkboard, copy the following flowchart:





2. Ask students if they can convert it into a computer program. Have them write it out on paper first.

3. Allow time for them to try it out on a microcomputer. Provide other assignments, as appropriate, in Mathematics and a rotation schedule for using the computers. Have them write on the same paper what the program actually does. Ask them to tabulate values of each variable as it is processed.

Variables

		C	S	N	A
Input	1st				
	2nd				
	3rd				
	4th				

4. After all have had adequate time to try out their programs, discuss the results. If students' programs vary in format but provide the same output, have students show these variations to the class on the demo microcomputer.

   a. A sample program is:

```
5   REM    AVERAGING
10  REM    VARIABLES USED ARE:
15  REM    C = COUNTER
20  REM    S = SUM
25  REM    N = NUMBER INPUT
30  REM    A = AVERAGE
35  REM    A$= ANSWER
40  LET    C = 0
45  LET    S = 0
50  LET    C = C+1
55  INPUT  "ENTER A NUMBER FOR CALCULATING AVERAGES "; N
60  LET    S = S+N
65  INPUT  "DO YOU WISH TO CONTINUE? "; A$
70  IF     A$ = "YES" or A$ = "Y" THEN GOTO 50
75  LET    A = S/C
80  PRINT  "THE AVERAGE OF YOUR NUMBERS IS "; A
85  END
```

SAMPLE ACTIVITY #3
Exploring Low Resolution Graphics

Subject:

Mathematics

Student Expectation(s):

1.1.1. Recognizes computer instructions
1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.3. Develops algorithm for problem solving

Instructional Mode:

Tutee/Topic

Prerequisite(s):

Students should know how to operate the microcomputer, be familiar with the BASIC statements of REM, PRINT, LET, IF-THEN, FOR-NEXT, END and have been introduced to low resolution graphics. Entry Level Sample Activities #3, #4 and #5 should have been covered. Also helpful is Sample Activity #2 in Mathematics - Beginning Low-Resolution Graphics--in the Exploratory Computer Literacy Curriculum Guide, Grades 7-8.

Classroom Management:

A lab setting with two students per computer is recommended. Monitors must be in color. One computer with a large color monitor should be available for class demonstration purposes. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers that support color graphics. (This activity is assuming Apple II equipment and Applesoft BASIC. Because of variations among brands of computers, certain modifications of this activity may be necessary.)
Resources for reference or text, such as:
  Spotlight on Computer Literacy by Ellen Richman, Chapter 24;
  Computer Literacy--A Hands-On Approach by Arthur Luehrmann and Herbert Peckham, Part 3;
  Computer Literacy--Programming, Problem Solving, Projects On the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 62-67;
  Graphics Discoveries, Book I by Jerry Johnson, (especially helpful with program ideas.)

Time for Activity:

Two to three class periods, depending on the number of microcomputers available and the students' level of BASIC skills.

Teacher Preparation:

Practice a few simple programs; explore new possibilities. Review the BASIC random statement, as presented in Spotlight on Computer Literacy by Ellen Richman, Chapter 21.

1. Review key concepts on low-resolution graphics from previous activities, if needed. A Graphics Summary Sheet follows this activity.

2. Introduce the concept of randomness as used in BASIC on your particular microcomputer. Contrast the simpler statement of RND(25) for some machines with the more complex statement of INT (25 * RND (1)) + 1 for Apple. Both render random numbers from 1 to 25.

   a. Demonstrate a number guessing game on the Apple by keying in and running the following program:

```
NEW
10  LET    N = INT (10 * RND (1)) + 1
20  PRINT  "GUESS MY NUMBER FROM 1 TO 10."
30  INPUT  G
40  IF     G = N THEN GOTO 70
50  PRINT  "THAT'S NOT IT. TRY AGAIN."
60  GOTO   30
70  PRINT  "YOU GUESSED IT!"
80  END
```

3. Incorporate the new RND statement in a simple graphics program by keying in the next example:

```
NEW
10  HOME
20  GR
30  COLOR  = INT (16 * RND (1))
40  FOR    ROW = 0 TO 39
50  PLOT   INT (40 * RND (1)), ROW
60  NEXT   ROW
70  GOTO   30
80  END
```

   Before running the program, ask why 16 was selected for color and no "+1" in the function; likewise, 40 for plotting the column. Have students predict the output. Then run the program. (Remind students about avoiding infinite loops in their programs; show how to terminate the run.)

4. Assign the following problem. Have students work in pairs. An algorithm must be first designed and the coding planned before working

at the computers. A print-out of the listing should be made when finished.

Design a program that will fill the graphics screen with horizontal bars, each bar being of a different random color. As with the earlier "screen wash" program, start at the upper left edge of the screen; use FOR-NEXT and RND statements. For a bonus, continue the program and allow it to fill the screen with vertical bars, each bar being of a different random number.

Although there are several ways to solve this problem, one possibility is offered below.

```
  5 REM    COLORED BARS
 10 HOME
 20 GR
 30 FOR    ROW = 0 TO 39
 40 LET    RNUM = INT (16 * RND (1))
 50 COLOR  = RNUM                          For colored horizontal bars
 60 FOR    COL = 0 TO 39
 70 PLOT   COL, ROW
 80 NEXT   COL
 90 NEXT   ROW
100 FOR    COL = 0 TO 39
110 LET    CNUM = INT (16 * RND (1))
120 COLOR  = CNUM                          For colored vertical bars
130 FOR    ROW = 0 TO 39
140 PLOT   COL, ROW
150 NEXT   ROW
160 NEXT   COL
170 END
```

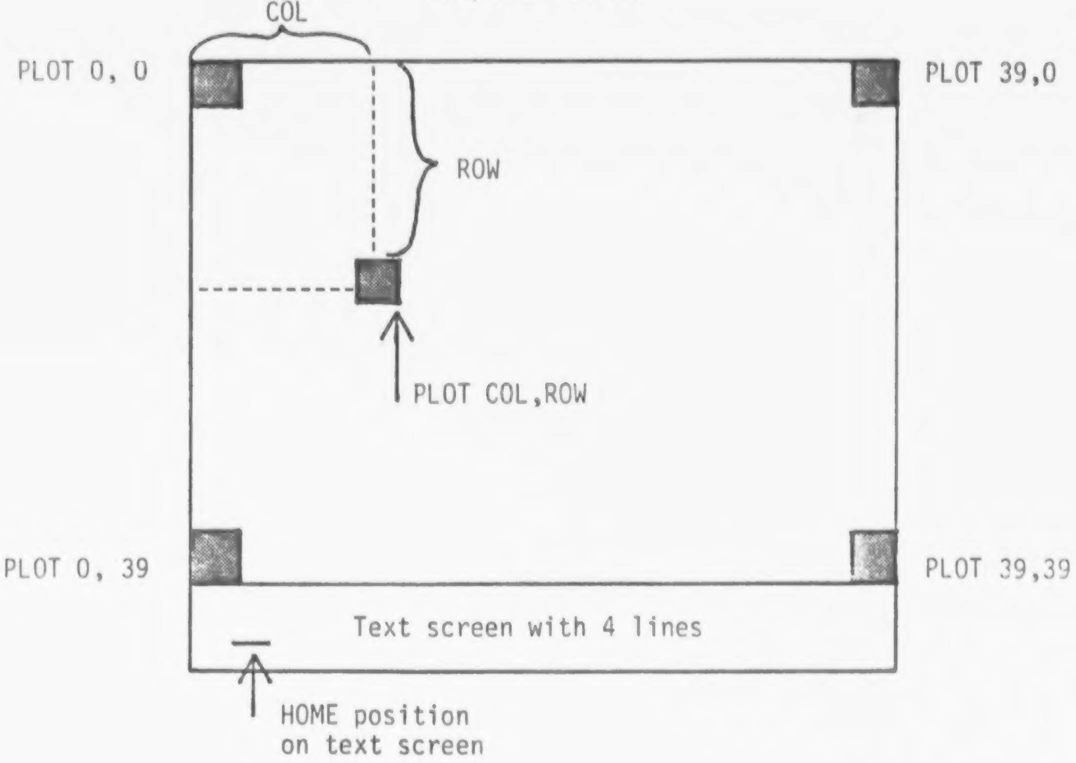
5. When all pairs of students have had a fair chance at trying out their programs, compare listings and discuss results. Have a student key in a successful program and run it.

GRAPHICS SUMMARY SHEET
Applesoft BASIC

Available Color and Their Reference Numbers

0 = black
1 = magenta
2 = dark blue
3 = purple
4 = dark green
5 = gray
6 = medium blue
7 = light blue
8 = brown
9 = orange
10 = gray
11 = pink
12 = green
13 = yellow
14 = aqua
15 = white

Graphics Screen



Sample Program to Illustrate Use of Each Graphics Command

Command	Comment
10 GR	Clears screen (except for bottom 4 text lines) and enters graphics mode.
20 COLOR = 9	Establishes orange as the plot color.
30 PLOT 15, 22	Plots an orange block at the intersection of the 15th column and the 22nd row.
40 HOME	Clears text screen and moves cursor to upper left corner of text screen.
50 TEXT	Resets the full screen to the text mode.
60 END	

SAMPLE ACTIVITY #4
Spreadsheet Survey

Subject:

Mathematics

Student Expectation(s):

1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affects words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstration there should be one microcomputer with a large monitor or two. One or two printers should be available. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printers.
Spreadsheet software such as:
    Visicalc or LOTUS.
Blank diskettes.
Handout for demonstration and exercise.

Time for Activity:

Two to three class periods, depending on the number of microcomputers available. Time is needed for the survey-demonstration, work sessions and class discussion.

Teacher Preparation:

Become familiar with the software program and accompanying manual. Initialize as many diskettes as there are teams of students. Prepare a spreadsheet page on disk, such as this example. Have the necessary formulas entered in the proper cells. Prepare the handout sheet.

CLASS SURVEY

MATHEMATICS

QUESTION: WHAT ARE YOUR IMPRESSIONS OF THE USE OF COMPUTERS IN THE CLASSROOM?

	AGREE	DISAGREE
USEFUL		
FUN		
NECESSARY		
HERE TO STAY		
POTENTIAL FOR GREATER USE		
TOTALS		
PERCENTAGE OF CLASS		

1. Begin this activity by taking a class survey on their impressions of the use of computers in the classroom. Inform them that they must either agree or disagree to each of the possible descriptions given above. Have a student tally these responses on the chalkboard.

2. After the survey has been taken, quickly load the spreadsheet software and the prepared disk. Type the number of responses in the proper cells. When all the data are entered, show how the spreadsheet automatically gives the totals and percentages.

3. Discuss what an electronic spreadsheet is. Ask students if they have used one before; if so, have one or two students explain for what purpose they used it.

4. Elicit ideas from the class as to what other purposes spreadsheets could serve, (budgets, inventory, grading systems, research-data collecting, etc.) Ask students if this "insight" into computer use has changed any of their opinions from the survey.

5. Distribute a handout that summarizes the functions of the spreadsheet the class will be using and explains the assignment to be done. Demonstrate how this particular spreadsheet works.

   a. How to start the program;
   b. How to enter a label, a value or a formula (value reference);
   c. How to change column width;
   d. How to insert/delete a column or row;
   e. How to implement formulas (adding, finding averages, etc.);

f. How to copy a cell to another area;
g. How to print the worksheet.

6. To practice using this software, have students work in pairs on a short assignment, such as setting up a spreadsheet with the following format. Inform students that the retail cost is a 40% markup on every item and the profit is the difference between retail and wholesale costs.

The Best Department Store

Items for Sale	Wholesale	Retail	Profit
Neckscarves	5.00		
Headbands	2.00		
T-shirts	3.50		
Jogging Shorts	7.75		
TOTAL			

7. Have students print out their spreadsheets. After all pairs of students have completed this exercise, show, compare and discuss results.

SAMPLE ACTIVITIES
SCIENCE

SAMPLE ACTIVITY #1
If Mendel Had Had a Computer.

Subject:

Science (Biology or Life Science is most appropriate.)

Student Expectation(s):

1.4.1. Recognizes programming languages
1.4.2. Operates with words/symbols
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Topic/Tutee

Prerequisite(s):

Students should have had previous hands-on experience with a microcomputer and preferably some background in BASIC. They should be currently studying (or have studied) Mendel's Laws of Heredity.

Classroom Management:

One microcomputer with a large classroom monitor is needed for demonstration purposes.

Material(s):

Biology textbooks with a unit on Mendel's Laws.
One microcomputer with a large classroom monitor.
Overhead projector and transparency of program.

Time for Activity:

One class period.

Teacher Preparation:

Try out the program by keying it in and testing it. Review the BASIC random statement, as presented in Spotlight on Computer Literacy by Ellen Richman, Chapter 21. Prepare the overhead transparency.

1. Review the material covered on Mendel's Laws:

One of Gregor Mendel's fascinating discoveries was that the offspring of randomly cross-fertilized hybrid plants exhibit dominant and recessive traits according to mathematical patterns. Mendel demonstrated the probability that for every four offspring produced, three would exhibit the dominant characteristic, and one would show the recessive characteristic.

For example, consider a hybrid tall pea plant crossed with another hybrid tall plant. Both parent plants carry the recessive gene for shortness. Mendel discovered that as the number of crossings increases, the ratio of tall to short offspring gets closer and closer to 3 to 1.

Mendel spent years patiently compiling records and tending pea plants to confirm his hypothesis. Today, using the random-number generating power of the computer, we can confirm the results of Mendel's experiments in a matter of seconds. This simple program (which some students could even write themselves) shows how a computer can simulate Mendel's experiments.

2. Hypothesize the 19th century monk having access to a microcomputer. How would that affect his work in genetics? Show on an overhead projector the following program in BASIC and brief students on its major functions. Introduce the concept of randomness as used in BASIC.

```
100 PRINT  TAB( 5)"THIS PROGRAM WILL SIMULATE"
105 PRINT  TAB( 2)"THE CROSSING OF TWO HYBRID PEA PLANTS"
110 PRINT
115 PRINT  TAB( 5)"TALL IS DOMINANT OVER SHORT"
120 PRINT
125 PRINT  TAB( 1)"YOU WILL SELECT THE NUMBER OF CROSSINGS"
130 PRINT  TAB( 1)"AND THE COMPUTER WILL RANDOMLY CALCULATE"
135 PRINT  TAB( 5)"THE GENETIC TYPE OF THE OFFSPRING"
140 PRINT
145 PRINT  TAB( 8)"LET 1= PURE TALL PLANTS"
150 PRINT  TAB( 8)"LET 2= HYBRID TALL PLANTS"
155 PRINT  TAB( 8)"LET 3= HYBRID TALL PLANTS"
160 PRINT  TAB( 8)"LET 4= PURE SHORT PLANTS"
165 PRINT  : PRINT
170 PRINT  TAB( 5)"HOW MANY CROSS-FERTILIZATIONS"
175 INPUT  X
180 FOR    N = 1 TO X
185 LET    R = INT (4 * RND (1)) + 1
190 LET    P(R) = P(R) + 1
195 NEXT   N
200 PRINT  TAB( 6)"GENETIC TYPE NUMBER OF TIMES"
205 FOR    C = 1 TO 4:  PRINT TAB( 10)C, P(C):  NEXT C
210 PRINT
215 PRINT  TAB( 5)"RATIO OF GENETIC TYPES 1-3 TO 4 IS "
220 PRINT  TAB( 20) (P(1) + P(2) + P(3)) / P(4);" TO 1"
225 END
```

3. Have a student experienced with BASIC type in the program on the microcomputer, which can be seen by all via the classroom monitor.

4. Run the program and elicit from the class increasingly large numbers of cross-fertilizations to see how the ratio of tall to short offspring changes.
5. Encourage students to try the same number more than once and to observe what happens.
6. Discuss how the computer could have benefited Mendel; how it might have hindered him; how BASIC can be used to support the laws of probability.
7. Have students suggest a simple BASIC program for rolling dice or tossing a coin, examples which are frequently used in Biology to illustrate the laws of probability. (Refer to Spotlight on Computer Literacy, Chapter 21.)

MENDEL'S PROGRAM

```
100 PRINT  TAB( 5)"THIS PROGRAM WILL SIMULATE"
105 PRINT  TAB( 2)"THE CROSSING OF TWO HYBRID PEA PLANTS"
110 PRINT
115 PRINT  TAB( 5)"TALL IS DOMINANT OVER SHORT"
120 PRINT
125 PRINT  TAB( 1)"YOU WILL SELECT THE NUMBER OF CROSSINGS"
130 PRINT  TAB( 1)"AND THE COMPUTER WILL RANDOMLY CALCULATE"
135 PRINT  TAB( 5)"THE GENETIC TYPE OF THE OFFSPRING"
140 PRINT
145 PRINT  TAB( 8)"LET 1= PURE TALL PLANTS"
150 PRINT  TAB( 8)"LET 2= HYBRID TALL PLANTS"
155 PRINT  TAB( 8)"LET 3= HYBRID TALL PLANTS"
160 PRINT  TAB( 8)"LET 4= PURE SHORT PLANTS"
165 PRINT  : PRINT
170 PRINT  TAB( 5)"HOW MANY CROSS-FERTILIZATIONS"
175 INPUT  X
180 FOR    N = 1 TO X
185 LET    R = INT (4 * RND (1)) + 1
190 LET    P(R) = P(R) + 1
195 NEXT   N
200 PRINT          TAB( 6)"GENETIC TYPE NUMBER OF TIMES"
205 FOR C = 1 TO 4:  PRINT TAB( 10)C, P(C):  NEXT C
210 PRINT
215 PRINT  TAB( 5)"RATIO OF GENETIC TYPES 1-3 TO 4 IS "
220 PRINT  TAB( 20) (P(1) + P(2) + P(3)) / P(4);" TO 1"
225 END
```

SAMPLE ACTIVITY #2
Computer Simulation

Subject:

Science (General or Physical Science is most appropriate.)

Student Expectation(s):

1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
4.2.1. Describes how computers assist people

Instructional Mode:

Tutor/Tool

Prerequisite(s):

Students should have had previous hands-on experience with a microcomputer. They should be studying a unit in Geology.

Classroom Management:

A lab setting with two students per computer is recommended. One microcomputer with a large classroom monitor could be used for introductory purposes.

Material(s):

"Geology Search" simulation program by T. F. F. Snyder and Computer Learning Connection, Inc., published by Webster Division, McGraw-Hill Book Co.
Student Searchbooks and Teacher's Manual.

Time for Activity:

Two to ten class periods, depending on the number of activities selected from the student Searchbook and on the number of microcomputers available.

Teacher Preparation:

Read the background information in the Teacher's Manual. Run through the entire program yourself.

1. Introduce and manage the activity as suggested in the Teacher's Manual. Review the geological concepts and vocabulary used in the simulation.

2. Run through one activity of the Geology Search simulation for the whole

class. Show how they will participate in the search for oil by instructing the computer to perform various geological tests at different sites on a fictitious continent.

3. Clarify the need for teamwork in reading the necessary material in the student Searchbooks, collecting, interpreting and recording data concerning rocks, fossils and underground structures; and making decisions regarding drilling.

4. Assign specific activities from the student Searchbook; have students work in teams of two to four people; request a worksheet on each activity from each team.

5. Discuss results of each activity and include the role of the computer in this learning process:

   a. How does the computer show what geological formations are really like?
   b. What aspects of searching for oil are not reflected in this simulation?
   c. Does the program allow enough choices for action in order for us to make intelligent decisions about where to drill for oil?
   d. What assumptions are built into this computer model?
   e. Is the probability of finding oil in this simulation greater than the probability in real life? Why or why not?

SAMPLE ACTIVITY #3
Graphing Data

Subject:

Science (Life or Physical Science is most appropriate.)

Student Expectation(s):

1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with operating the microcomputer. Also they should have done some science laboratory work in which data have been collected.

Classroom Management:

A lab setting is recommended. One microcomputer with a large monitor or two should be available for classroom demonstration purposes. The class will then have to divide into teams for using the computers.

Material(s):

A plotting program such as:
    Dataplot program, from Muse-Software, Inc., or Appleplot program, from Apple Computer, Inc., or PFS: Graph, from Software Publishing Corporation.
Microcomputers and printers.

Time for Activity:

Two class sessions. Class demonstration of about 15 minutes; team work time for the remainder of the first period. A follow-up discussion-demonstration for the second session.

Teacher Preparation:

. Read the documentation that comes with the software you plan to use and try out the program with a sample of students' data.

1. Demonstrate to the class the process of inputting a set of their data.

Show how to develop various kinds of graphs for the same data and compare the usefulness of each graph for the purpose of the particular lab activity.

2. Allow students to work as teams, so each team can input their own data on the computer and print out their graphs. Meanwhile each student should be assigned to prepare a traditional graph on paper. (Plotting data by hand is still an important skill.) Intermingle with students to help when needed.

3. Upon completion of the graphing exercises, show various sets of student data on the demonstration computer. Plot the data from all teams on one graph. Interpret the graphs with the class. Compare the appropriateness of certain kinds of graphs to certain situations.

4. Have students discuss the advantages and disadvantages of using the computer for graphing data. Discuss why a research scientist would use the computer in analyzing data. Include concerns for speed, repetition and handling large amounts of data.

SAMPLE ACTIVITIES
SOCIAL STUDIES

SAMPLE ACTIVITY #1
Computers, Privacy and Ethics

Subject:

Social Studies

Student Expectation(s):

3.3.5. Understands effects on economics, politics, crime

Instructional Mode:

Topic

Prerequisite(s):

Students should have experience using software. This activity is best introduced when an ethical issue involving computers arises in the classroom, such as copying software.

Classroom Management:

No computer is required. Students should work independently.

Material(s):

Handouts on scene from movie and novel, "War Games", plus other case studies.

Resources for reference or text, such as:

- Scholastic Computing--An Introduction to Computers by Jack L. Roberts, pages 226-233;
- Computer Literacy--Problem-Solving with Computers by C. E. Horn and J. L. Poirot, pages 98-107;
- Computer Literacy--Programming, Problem Solving, Projects on the Apple by Warren and Bobbie Jones, Kevin Bowyer and Mel Ray, pages 218-225;
- Spotlight on Computer Literacy by Ellen Richman, Chapter 12;
- "To Copy or Not to Copy: A Moral Dilemma" by Tim Barry from Infoworld, (September 29, 1980) pages 5-6;
- "Washington Tackles the Software Problem" by Christopher Kern from BYTE, (May 1981) pages 128-138;
- "Copying Software--Crime in the Classroom?" by Lauren Letellier from Electronic Learning (January/February 1982), pages 42-51;
- "Computers and Ethics", Computer Literacy Instructional Module by MECC (includes handouts).

Teacher Preparation:

Read selected materials on the topic, such as from the references suggested above.

1. Distribute the handout, page 105, on the scene from "War Games", as

typed below.

"What are you doing?" Jennifer asked softly.

"I'm dialing into the central school district's computer system. If we're lucky...Yep, it's available."

On the monitor, a flash of words appeared:
THIS IS THE GREATER SEATTLE UNIFIED SCHOOL DISTRICT DATANET. PLEASE LOG IN WITH USER PASSWORD AND ACCOUNT NUMBER.

David tapped the word "pencil" onto the keyboard. Immediately the screen displayed a list of subsystems.

"Go ahead, Jennifer. Just type out the words student transcripts."

"No. I don't...."

"Ah, c'mon. The computer won't bite." She stepped forward, found the right keys, and typed. STUDENT TRANSCRIPTS appeared on the screen.

"There we go. Now...What's your I.D. number?" Jennifer muttered some letters and David typed them out. Immediately the transcripts for MACK, JENNIFER D. appeared.

"What are you doing now?" Jennifer asked.

"I'm changing your biology grade."

"Wait a minute. You're going to get me in trouble," Jennifer protested.

"Relax. No one will find out," David said changing the grade from an F to a B. "Now you don't have to go to summer school."

"Change it back," Jennifer demanded.

"Why?"

Have students read it for discussion purposes.

2. Include in the discussion these questions:

   a. How would you answer that question?
   b. Suppose you lived where there was a law about the unauthorized use of a computer. What would you tell David about what he has done?
   c Suppose you lived in a place where there wasn't such a law. What would your answer be then?

3. Have students read and discuss three more examples of how some people have misused the computer, (also typed on the handout).

   a. A teenage girl keeps her "diary" on a computer disk. One afternoon, her ten-year-old brother sneaks into her room, loads the "diary program," and reads his sister's private information.
   b. John is on the staff of his school newspaper. He needs some information that another staff member, named Alice, has stored on her personal disk. Alice, however, is home sick. "I know her password for the disk," John thinks to himself. "It won't hurt if I look through the files she has on the disk to find the information I need."
   c. A young girl hears about a terrific new adventure game for her computer, but she cannot afford to buy it. A friend of hers already has the program. He says he will make a copy of it and sell it to her for halfprice. She takes him up on the offer.

4. Consider the following questions.

   a. Think about each of these situations. Should the ten-year-old boy's actions be considered a crime?
   b. Is it all right for the reporter to look through someone's files for information he "must have"?
   c. Is it wrong for the girl to buy the copy of the adventure game?
   d. What about the boy who sells it to her? Is he in the wrong?

   Students might want to form a "court" to hear and judge the cases presented. Have volunteers plead for and against the conduct described.

5. Assign some reading material on computer ethics and privacy from the resources listed above or other related articles. Include, if possible, actual legal rulings. Accompanying questions could be assigned. Allow time for a follow-up discussion.

6. Take a poll on student opinion concerning rights of access to copyrighted computer software and to data bases containing private information. The following page could be used for such a survey.

Be the Judge

Legal or illegal? Ethical or unethical? Judges face new questions every day about right to computer software and computer information.

A. Be a judge! Imagine that you hear the arguments below in your courtroom. On the line to the left of each argument, place the letter of the rating you think it deserves. (Use the following rating scale.)

Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
A	B	C	D	E

___ 1. "Computer owners should be free to make copies of any software they buy, whether or not it's copyrighted."
___ 2. "Breaking into a data bank is a test of how smart you are."
___ 3. "Using an idea from commercial software in your own program is like using facts from an encyclopedia in your term paper."
___ 4. "Copying a manufacturer's software is like making copies of TV programs on my video recorder--and recording TV is legal."
___ 5. "Breaking into a data bank to get information is not wrong; it's not like taking money."
___ 6. "If data bank owners can't protect their password system, it's their responsibility when hackers (outsiders) break in."
___ 7. "Breaking into a protected data bank is not wrong unless you change some of the data you find."
___ 8. "It's all right to use ideas from a manufacturer's program to write your own software, provided you make some changes."
___ 9. "Breaking into a protected data bank is all right if you mean no harm."
___ 10. "Trading one copyrighted program for another is not wrong if there's no money involved."

B. Pick one of the statements above and explain your rating for it.

Statement #_____ My Rating _____

Explanation for my rating: ______________________________

C. Have someone tally your classmates' (unsigned) ratings. Discuss the general results. Are there different viewpoints on computer uses and crime? Is there a way to reconcile these differences?

HANDOUT QUESTIONS FOR DISCUSSION

"What are you doing?" Jennifer asked softly.

"I'm dialing into the central school district's computer system. If we're lucky...Yep, it's available."

On the monitor, a flash of words appeared:

THIS IS THE GREATER SEATTLE UNIFIED SCHOOL DISTRICT DATANET. PLEASE LOG IN WITH USER PASSWORD AND ACCOUNT NUMBER.

David tapped the word "pencil" onto the keyboard. Immediately the screen displayed a list of subsystems.

"Go ahead, Jennifer. Just type out the words student transcripts." "No. I don't...."

"Ah, c'mon. The computer won't bite." She stepped forward, found the right keys, and typed. STUDENT TRANSCRIPTS appeared on the screen.

"There we go. Now...What's your I.D. number?" Jennifer muttered some letters and David typed them out. Immediately the transcripts for MACK, JENNIFER D. appeared.

"What are you doing now?" Jennifer asked.

"I'm changing your biology grade."

"Wait a minute. You're going to get me in trouble," Jennifer protested.

"Relax. No one will find out," David said changing the grade from an F to a B. "Now you don't have to go to summer school."

"Change it back," Jennifer demanded.

"Why?"

1. Consider these questions:
   a. How would you answer that question?
   b. Suppose you lived where there was a law about the unauthorized use of a computer. What would you tell David about what he has done?
   c Suppose you lived in a place where there wasn't such a law. What would your answer be then?

2. Here are a few other examples of computer misuse.
   a. A teenage girl keeps her "diary" on a computer disk. One afternoon, her ten-year-old brother sneaks into her room, loads the "diary program," and reads his sister's private information.
   b. John is on the staff of his school newspaper. He needs some information that another staff member, named Alice, has stored on her personal disk. Alice, however, is home sick. "I know her password for the disk," John thinks to himself. "It won't hurt if I look through the files she has on the disk to find the information I need."
   c. A young girl hears about a terrific new adventure game for her computer, but she cannot afford to buy it. A friend of hers already has the program. He says he will make a copy of it and sell it to her for halfprice. She takes him up on the offer.

3. Consider the following questions.
   a. Think about each of these situations. Should the ten-year-old boy's actions be considered a crime?
   b. Is it all right for the reporter to look through someone's files for information he "must have"?
   c. Is it wrong for the girl to buy the copy of the adventure game?
   d. What about the boy who sells it to her? Is he in the wrong?

SAMPLE ACTIVITY #2
Developing and Utilizing a Data Base

Subject:

Social Studies

Student Expectation(s):

1.2.4. Recognizes computer processes
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affect words
2.1.1. Uses computer in decision making
2.1.4. Assists in problem solving/decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
3.3.4. Values communication/information
3.3.6. Identifies applications of computer science
4.1.1. Lists limitations
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. They should be currently studying the Thirteen Colonies in American History.

Classroom Management:

For the classroom demonstration one microcomputer with a large monitor or two should be used. If two or four microcomputers are available, pairs of students can use them on a rotational basis. Refer to Activity Guidelines, page 35, for further details.

Material(s):

PFS: File, published by Software Publishing Corporation, or some other program for storing and retrieving data.
Program user manual.
Microcomputers with two disk drives each.
A Colonies Data Base on disk.
Course textbooks on American History.
Library reference books for research purposes.

Time for Activity:

One week or so, depending on the number of available microcomputers. One period is needed for demonstration, discussion and planning of activity. Two days are best for research in the library and data entry on the computers. One day is needed for completing reports and the final day is for class discussion and sharing results.

Teacher Preparation:

Spend a few hours experimenting with the program, to become familiar with its operation and documentation. Use the DESIGN function to build a file for the colonies data, according to a format similar to the one below:

COLONIES DATA BASE

Colony:

Year of Settlement (NNNN):

Original Settlers Birthplaces:

Dominant Religion:

Trade:

Major Industries:

Number of Ports (NN):

Local Government Structure:

Presence of English Governors or Troops:

Press Ctrl and N for page 2;
Press Ctrl and C for Menu.

Add a form to the file for each colony, filling in only the colony name. After students have entered the data on their data disks, be sure to combine their disks into one master disk for the classroom data base using the COPY function.

1. Pose the problem of determining why some of the original Thirteen Colonies were more active in pressing for reforms or independence than were others. After eliciting hypotheses about the reasons for this historical fact, introduce the idea of creating a computerized data base of key information on each colony.

2. Review with the class the terms "data base" and "information retrieval." Distinguish the terms field, record and file in a data base.

3. Have students work in pairs (mostly), assigning one of the thirteen colonies to each.

4. Demonstrate PFS: File (or similar software) and the procedure the students will follow in searching, updating, sorting and printing out data on the colonies. Show how and when to use both the program disk and the colony data-base disk.

    a. Run through the specifics of retrieving one colony, such as Massachusetts, and updating it by inserting data in one field, Year of Settlement.
    b. Clarify the need for entering the full field for numeric entries, such as number of Ports (NN): 0 3. This is known as fixed-length data and is especially important for comparison purposes. PFS doesn't distinguish the place value of numeric fields, so 3 would seem larger than 15, since PFS takes the first digit from left to right in comparing two separate numbers.
    c. Show how the PRINT function and SORT selection work. Remind students to always check the printer before printing to see if it is on and the paper is properly loaded.

5. Allow students time to research the needed data for their colony from the school library or classroom reference books. Included in their findings should be their colony's position on independence. When ready, have them enter the data on the data base. Signing up for computer time should be a prerequisite for using the equipment.

6. Have students sort the file by categories to examine differences and similarities among the colonies. These comparisons will help students test the validity of their hypotheses. Each pair or team of students must prepare a report that proposes their hypothesis about the reasons for their colony's position on independence and any supportive data for this stand from the Colony Data Base.

7. Let students present their reports to the class. Allow responses from other students. Discuss the kinds of information they might add to the data base to shed more light on the issue. Soon the data base will have grown until there are substantial data for other investigations, such as: What were some of the factors that influenced the start of the American Revolution?

8. Introducing the class to a word processor at this time would be appropriate for facilitating report-writing and for increasing computer literacy. Refer to Entry Level Sample Activity #6 - Beginning Use of Word Processor--or Sample Activity #1 - A Community Novel and the Word Processor - in Language Arts.

SAMPLE ACTIVITY #3
Checking Taxes on a Spreadsheet

Subject:

Social Studies

Student Expectation(s):

1.1.5. Experiments as a user
1.1.6. Responds to error messages
1.5.1. Seeks work/play with computer
1.5.2. Uses positive affects words
2.1.1. Uses computer in decision making
3.2.1. Identifies applications
3.3.1. Values efficient information processing
4.2.1. Describes how computers assist people

Instructional Mode:

Tool/Topic

Prerequisite(s):

Students should be familiar with the operation of the microcomputer and be able to use the keyboard comfortably. A session on statistics would be appropriate prior to work on spreadsheets.

Classroom Management:

A lab setting with two students per computer is recommended. For the classroom demonstration there should be one microcomputer with a large monitor or two. Refer to Activity Guidelines, page 35, for rotating students.

Material(s):

Microcomputers and printers.
Spreadsheet software such as:
    Visicalc or LOTUS.
Blank diskettes.
Handout for demonstration and exercise.
Numerous IRS forms and tax tables from the most recent tax year.

Time for Activity:

Three to four class periods, depending on the number of microcomputers available. Time is needed for a demonstration, work sessions and class discussion.

Teacher Preparation:

Become familiar with the software program and accompanying manual. Initialize as many diskettes as there are teams of students. Prepare the handout.

1. Explain what an electronic spreadsheet is.

2. Distribute a handout that summarizes the functions of the spreadsheet the class will be using. Demonstrate how this particular spreadsheet works.

   a. How to start the program;
   b. How to enter a label, a value or a formula (value reference);
   c. How to change column width;
   d. How to insert/delete a column or row;
   e. How to implement formulas (adding, finding averages, etc.);
   f. How to copy a cell to another area;
   g. How to print the worksheet.

3. To practice have students work in pairs on a short assignment, such as setting up a spreadsheet for the following format. All labeled columns must have data entered. Students' names can be entered for the Employee column.

CARD NO.	NAME OF EMPLOYEE	HOURS WORKED	TOTAL HRS. WORKED	PAY PER HOUR	TOTAL WAGES

4. After all pairs of students have completed their practice exercise and results have been shown and discussed in class, introduce a more involved topic--Federal Taxation.

5. Have each student invent a hypothetical person and assign that person an annual income and family size. Have students list these hypothetical statistics on the chalkboard for the whole class to copy and incorporate in a spreadsheet.

6. Each pair of students must design an appropriate spreadsheet and incorporate the hypothetical statistics in it. Using recent IRS tax tables, ask them to record the amount of tax each person must pay. Also with the use of the electronic spreadsheet, have students compute each person's taxes as a proportion of total income. Have students print out their spreadsheets and compare results. A possible spreadsheet design follows this activity.

7. Among the questions for students to consider and discuss should be:

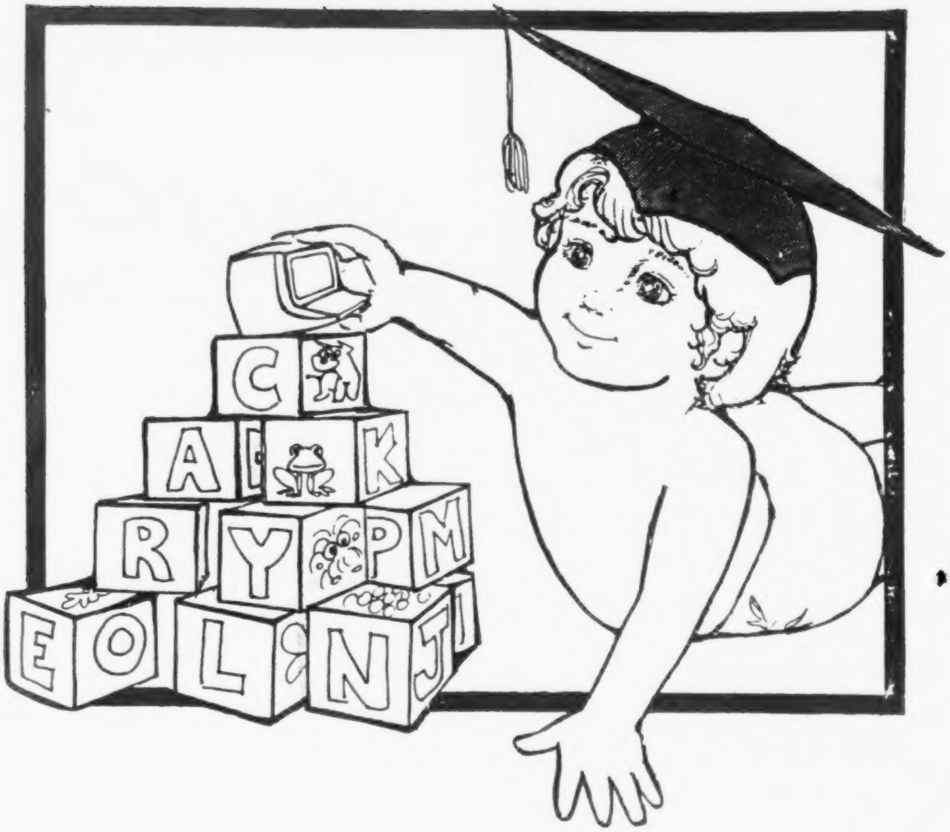
   a. Are people taxed at a higher rate as their salaries increase?
   b. How does the tax rate change when a person's marital status or number of dependents changes?
   c. Compare families with the same marital status and number of children; this will make statistical analysis more systematic and meaningful.
   d. What are the pros and cons of the graduated tax system?

8. This is one possible layout for the tax spreadsheet.

FEDERAL TAX SPREADSHEET

NAME	ANNUAL INCOME	MARITAL STATUS	FAMILY SIZE	TAX	TAX % OF INCOME

APPENDIX



APPENDIX A

EXPLORATORY COMPUTER LITERACY FRAMEWORK

EXPLORATORY COMPUTER LITERACY FRAMEWORK

GOALS: The student will feel confident about using computers

The student will know how the computer can be used as a tool for problem solving and decision making.

The student will be aware of, appreciate, and understand the functions and impact of computers in daily life.

The student will recognize the limitations as well as the usefulness of computer (science) technology in advancing human welfare.

The student will recognize educational and career opportunities related to the specific and general uses (application) of computers.

I. The student will feel confident about using computers.

A. Demonstrations of confidence implies ability to use the computer.

1. Interact with a prepackaged computer program.

(GRADE 3 EXPECTATION: THE STUDENT RECOGNIZES THAT A COMPUTER NEEDS INSTRUCTIONS TO OPERATE.)

(GRADE 3 EXPECTATION: THE STUDENT READS INSTRUCTIONS, THE KEYBOARD, AND OUTPUT.)

(GRADE 3 EXPECTATION: THE STUDENT USES BASIC CONTROL KEYS AND COMMANDS.)

(GRADE 6 EXPECTATION: THE STUDENT SELECTS AND USES APPROPRIATE RESOURCES (MANUALS) FOR OPERATING THE COMPUTER.)

(GRADE 6 EXPECTATION: THE STUDENT EXPERIMENTS WITH PROGRAMS AS A USER.)

(GRADE 6 EXPECTATION: THE STUDENT TAKES APPROPRIATE ACTION IN RESPONSE TO ERROR MESSAGES IN USING PREPACKAGED PROGRAMS.)

2. Identify the fact that information is processed according to a set of predefined computer rules: organize, coded, given meaning and transmitted.

(GRADE 6 EXPECTATION: THE STUDENT GIVES REASONS FOR PROCESSING INFORMATION.)

(GRADE 6 EXPECTATION: THE STUDENT DETERMINES THE STRUCTURAL COMPONENTS OF INFORMATION PROCESSING, E.G., ORGANIZING, CODING, PROCESSING AND REPORTING.)

(GRADE 6 EXPECTATION: THE STUDENT SEQUENCES THE STEPS REQUIRED IN A PROCESS.)

(GRADE 12 EXPECTATION: THE STUDENT RECOGNIZES THAT COMPUTERS PROCESS INFORMATION BY SEARCHING, SORTING, DELETING, UPDATING, SUMMARIZING, STORING, ETC.)

3. Identify the fact that we communicate with computers through specific symbols and words.

   (GRADE 8 EXPECTATIONS: THE STUDENT RECOGNIZES THAT PROGRAMMING LANGUAGES ARE USED TO GIVE INSTRUCTIONS TO COMPUTERS.)

   (GRADE 8 EXPECTATION: THE STUDENT RECOGNIZES WORDS OR SYMBOLS THAT OPERATE THE COMPUTER.)

4. Use computer languages (e.g., BASIC, PASCAL, LOGO, assembler/machine languages.)

   a. Develops good programming style (includes logical structure, documentation readability, efficiency, elegance).

   b. Selects and uses appropriate utility programs.

B. Develop positive attitudes and behaviors toward computers

   (GRADE 6 EXPECTATION: THE STUDENT DEMONSTRATES POSITIVE ATTITUDES AND BEHAVIORS TOWARD COMPUTERS IN THE FOLLOWING WAYS:

   1) SEEKS WORK OR PLAY WITH COMPUTERS.

   2) DESCRIBES PAST EXPERIENCES WITH COMPUTERS WITH POSITIVE-AFFECT WORDS LIKE FUN, EXCITING, CHALLENGING, ETC.)

II. The student will understand how a computer can be used as a tool for problem solving and decision making.

A. Explains what a simple algorithm/flowchart accomplishes, i.e., interpret, generalize, and discuss applications.

   (GRADE 8 EXPECTATION: THE STUDENT INTERPRETS, GENERALIZES, AND DISCUSSES APPLICATIONS OF A SIMPLE ALGORITHM/FLOWCHART.)

B. Uses a computation/information system (computer or computer system) to solve simple problems and make decisions.

   (GRADE 8 EXPECTATION: THE STUDENT TRANSLATES A SIMPLE ALGORITHM/FLOWCHART INTO A PROGRAM.)

   (GRADE 12 EXPECTATION: THE STUDENT DEVELOPS AN ALGORITHM FOR SOLVING A SIMPLE PROBLEM AND/OR TO SOLVE A SET OF SIMILAR PROBLEMS.)

III. The student will be aware of, appreciate, and understand the functions and impact of computers in daily life.

A. Functions are treated at two different levels:

1. Identification of basic operations of computer systems including identification of input, memory, control, arithmetic and output components.

(GRADE 3 EXPECTATION: THE STUDENT IDENTIFIES THE INPUT AND OUTPUT UNITS.)

(GRADE 6 EXPECTATION: THE STUDENT DESCRIBES THE FUNCTIONS OF THE INPUT, OUTPUT, AND CPU COMPONENTS.)

(GRADE 8 EXPECTATION: THE STUDENT DESCRIBES THE FUNCTIONS OF THE INPUT, OUTPUT, CPU, ARITHMETIC, AND MEMORY COMPONENTS.)

(GRADE 8 EXPECTATION: THE STUDENT INVESTIGATES ELECTRONIC COMPONENTS AND THEIR FUNCTIONS.)

2. Recognition and use of the data processing, process control, and information storage and retrieval applications in business and industry, government, education, health and social services, recreation, creative arts, etc.

(GRADE 6 EXPECTATION: THE STUDENT IDENTIFIES COMPUTER APPLICATIONS IN BUSINESS AND INDUSTRY, GOVERNMENT, EDUCATION, HEALTH AND SOCIAL SERVICES, RECREATION, CREATIVE ARTS, ETC.)

B. Impact is treated in relation to how computers affect employment, public surveillance, privacy of individuals, progress and culture, personalization/impersonalization, regulatory and enforcement functions, and daily relationships with people, agencies, organizations, etc.

1. Values efficient information processing.

2. Understands advantages and disadvantages of routine tasks.

3. Appreciates economic benefits of computerization for society.

4. Values increased communication and availability of information made possible through computer use.

(GRADE 6 EXPECTATION: THE STUDENT VALUES INCREASED COMMUNICATION AND AVAILABILITY OF INFORMATION MADE POSSIBLE THOROUGH COMPUTER USE.)

5. Understands that computers can be used to effect the distribution and use of economic and political power, in criminal and other antisocial activities, to change society in undesirable ways.

6. Identifies specific applications of computer science and technology in medicine, law enforcement, education, engineering, business, transportation, military, recreation, government, library, creative arts, etc.

C. Understanding that technology differs from science in that the aim of technology involves the means of building and doing useful things while the aim of science is the development of knowledge and understanding.

(GRADE 6 EXPECTATION: THE STUDENT KNOWS HOW ELECTRONIC TECHNOLOGY EVOLVED.)

IV. The student will recognize the limitations as well as the usefulness of computer technology.

A. Recognize disadvantages of computers as tools -- dependency, limitations, costs.

(GRADE 8 EXPECTATION: THE STUDENT LISTS AT LEAST THREE LIMITATIONS OF COMPUTERS.)

B. Identify major applications of computers for information storage and retrieval, simulation and modeling, quality or process control and decision making, computation, data processing.

(GRADE 8 EXPECTATION: THE STUDENT SEQUENCES THE STEPS REQUIRED IN A PROCESS.)

(GRADE 12 EXPECTATION: THE STUDENT RECOGNIZES THAT COMPUTERS PROCESS INFORMATION BY SEARCHING, SORTING, DELETING, UPDATING, SUMMARIZING, STORING, ETC.)

C. Investigate major applications of computers for information storage and retrieval, simulation and modeling, quality or process control and decision making, computation, data processing.

V. The student will recognize educational and career opportunities related to the specific and general (application) of computers.

A. Support services: e.g., data entry, word processing, computer operations personnel, etc.

B. Technical services: e.g., programmer, analyst, data processer, equipment maintenance and repair personnel, etc.

C. Scientific personnel: e.g., computer scientist, electrical engineer, computer engineer, etc.

D. Computer skilled/applications personnel integrated with another category or career.

The following expectations are applicable to V, A-D.

(GRADE 3 EXPECTATION: THE STUDENT IDENTIFIES SUPPORT SERVICE, TECHNICAL AND SCIENTIFIC CAREERS IN THE COMMUNITY AND STATE THAT INVOLVE COMPUTERS.)

(GRADE 6 EXPECTATION: THE STUDENT IDENTIFIES NATIONAL AND INTERNATIONAL CAREERS THAT INVOLVE COMPUTERS.)

(GRADE 8 EXPECTATION: THE STUDENT COMPARES EDUCATIONAL REQUIREMENTS AND OPPORTUNITIES FOR CAREERS THAT INVOLVE COMPUTERS.)

APPENDIX B

TASK FORCE RECOMMENDATIONS

Exploratory Computer Literacy Delivery at the Secondary Level

The following five models for delivering Exploratory Computer Literacy are recommended by the Task Force as alternatives for schools to consider in offering this thematic subject. A discussion of the advantages and disadvantages of each alternative model is included:

1. Elective One-Semester Course

   Semester courses, addressing the student expectations identified for grade 8 or grade 12, may be offered as an elective. The courses would consist of classroom instruction in combination with hands-on experiences in a computer lab to maximize the number of students accommodated by the program.

   A course description is provided in Appendix B1.

   Advantages: Sufficient time is provided for development of computer literacy understandings, skills and attitudes. Student-computer ratio allows for adequate hands-on time.

   Disadvantages: Another semester elective may be difficult to schedule at the intermediate school level. Computer literacy experiences may be taught in isolation from application areas.

   Suggested Hardware Arrangement: Computer lab with 16 microcomputers and 4 printers. (Based on two students per computer.)

2. Unit Within Content Area Course

   A unit of study of set duration (4-8 weeks) would be worked into a part of a required course (e.g., language arts, social studies, mathematics). The unit would consist of hands-on experiences preceded by classroom instruction. The shorter duration would require greater concentration of time on the use of the computer and close coordination between the classroom teacher and the computer lab instructor.

   A sample school implementation plan is included in Appendix B2.

   Advantages: Computer literacy would be taught in a meaningful context. Student-computer ratio allows for adequate hands-on time. Many more students can be serviced in a school year.

   Disadvantages: The required course would have to be compressed or intensified to cover the necessary content. Computer literacy experiences may be limited to one content area application.

   Suggested Hardware Arrangement: Computer lab with 16 microcomputers and 4 printers. (Based on two students per computer.)

3. Shared Computer Lab or Resource Center

Instruction in computer literacy would be conducted in regular classrooms through existing courses (e.g., language arts, mathematics, social studies, science, business). Hands-on experiences would be provided in a computer lab where use is scheduled according to school-established criteria and procedures. Close coordination among the departments offering computer literacy experiences would be required.

Advantages: Computer literacy could be taught through a variety of applications. Computer use is maximized.

Disadvantages: Scheduling may be complex or inconvenient. Staffing requirements of the computer lab and coordination among application areas must be planned. Inservice training must be provided to a larger target group.

Suggested Hardware Arrangement: Computer lab with a minimum of 16 microcomputers and 4 printers.

4. Computer Mini-Lessons

A series of mini-lessons on different aspects of computer literacy could be introduced through existing courses in several content areas. Hands-on experiences could be provided in the classroom on a rotation basis. Coordination among departments offering computer literacy experiences would be required.

Advantages: Computer literacy could be taught through a variety of applications. Schools with limited hardware and facilities could provide computer experiences to students.

Disadvantages: Hands-on experiences would be limited. Access to microcomputers housed in a classroom would be restricted.

Suggested Hardware Arrangement: A minimum of 2-4 microcomputers and 1 printer to be rotated among classrooms.

5. Demonstration Mode

A unit of study for a set duration would be taught in an existing content area course. Instruction would be primarily through vicarious experiences provided through demonstrations, audio-visual presentations and off-computer exercises. Extremely limited hands-on experiences would be provided. This mode is included as an initial, interim model until schools are able to acquire additional equipment to increase students' hands-on time. Subsequently, the demonstration mode may be used in conjunction with one of the other four models.

Computer Education Course Description

EXPLORATORY COMPUTER LITERACY

(SEMESTER)
Grades 7-12

Objectives:

1. Develop knowledge of operations and functions of computers.
2. Develop ability to use the computer in learning.
3. Develop understanding of the impact, values and ethics of computer applications.
4. Develop knowledge of elementary programming concepts and skills

Description:

This course is designed to provide opportunities for students to develop computer literacy skills and understandings through classroom instruction in combination with hands-on computer experiences. The focus of the class is on using the computer in learning through CAI programs, word processing and other application packages, and information retrieval. Programming concepts and skills are taught in a problem-solving context. Discussion of the impact, values and ethics of computer applications are integrated into the course and not isolated as a separate unit.

Appendix B2

Sample School Plan
Model 2: Unit Within Content Area Course

Resources Required:

1 teacher, computer education
1 computer lab with 16 microcomputers

Plan Provisions:

1. A maximum of 30 students per classroom period can be serviced over a four-week period.

2. One required content area is chosen for the delivery of the program. Language arts of social studies is recommended.

3. Lesson plans are coordinated between the computer literacy teacher and the content area teacher such that:

   a. Lessons are curriculum related.
   b. A project is required.
   c. Grading is the responsibility of the content area teacher.
   d. Discipline is a shared responsibility.
   e. The content area teacher becomes more literate.

4. One week between sessions is allowed for the computer education teacher to prepare for the next teacher's classes.

Implications:

1. 192 students can be serviced in a four-week period.

2. 384 students can be serviced in a quarter.

3. A maximum of 1536 students may be provided computer literacy instruction in a year.

4. If only one grade level is targetted for computer literacy instruction, time can be scheduled for the further development of computer literacy skills in a different content area. Another alternative would be to lengthen the computer literacy period from four weeks to five or six weeks.

Content:

Minimum requirements as outlined by the Task Force.

1. Knowledge of operations and functions of computers.

2. Keyboarding skills.

3. Ability to use the computer as a tool in learning.
4. Knowledge of impact, values, and ethics of computer applications.

APPENDIX C

GLOSSARY OF ACRONYMS AND TERMS

ACRONYMS

AI	Artificial Intelligence - It is a branch of computer science dealing with the development of machines capable of carrying out functions normally associated with human intelligence such as learning, reasoning, self-correction, and adaptation.
BASIC	Beginners' All-Purpose Symbolic Instruction Code - This is a language used in most microcomputers.
BIT	Binary digit - The smallest unit of computer information. A single bit can specify either a one or a zero.
CAI	Computer-Assisted Instruction - This is the union of programmed instruction and interactive computer systems capable of providing four types of CAI: drill and practice, problem solving, tutorial and simulation.
CBE	Computer-Based Eduction - This is a collective term embracing Computer-Assisted Instruction and Computer-Managed Instruction.
CMI	Computer-Managed Instruction - This is a recordkeeping function of a computer that gives and stores student scores, level of skills, and resources used.
COBOL	Common Business-Oriented Language. It is one of the standard sets of languages most often used on large computer systems. It is geared toward business applications and is beginning to make an appearance on personal computers that have a business orientation.
CPU	Central Processing Unit - This is the brain of the computer which controls what the computer does, defined by a sequence of instructions known as a program.
CRT	Cathode Ray Tube - This is a television-like display screen that uses cathode rays to exhibit readable characters or graphic information. It is also known as a monitor.
DOS	Disk Operating System - This is a collection of programs which can facilitate the use of disk drive.
FORTRAN	Formula Translator - This early high-level language was devised for numerical computations, and although it is somewhat complex and obsolete, it is still one of the most widely used programming languages in scientific environments. Whereas BASIC can be interpreted, FORTRAN requires a compiler.
I/O	Input/Output - This refers to having input and output capabilities.
K	Kilobyte - This is an abbreviation for 1024 bytes...approximately one kilo or 1000.
LISP	List Processing - This is a widely used programming language in artificial intelligence research.

LSI	Large Scale I - This refers to the tens of thousands of microscopic selectronic circuits that are crowded onto a square measuring less than 1/8 inch on each side.
MODEM	Modulator/Demodulator - This device allows communications between computers over phone lines. It translates the computer's digital signals into audio signals and then back again for the receiving computer. An acoustic coupler sends and receives its signals directly through the mouthpiece and earpiece of the phone, whereas the direct-connect modems send and receive through wire connections to the phone.
PLATO	Programmed Logic for Automated Teaching Operations - This computer-based educational system involves a very large computer with 4000 terminals that can be located anywhere in the world. A unique feature of PLATO is that its monitors have a touch sensitive screen that can make responses to a touch made by a finger or a special pen.
RAM	Random Access Memory - This is the computer's general purpose memory, sometimes called read/write memory. RAM may be written to or read from by the Central Processing Unit. Information on RAM is usually volatile; that is it disappears when power to the computer is turned off.
ROM	Read Only Memory - This is a memory in which integrated circuits are programmed with special systems programs or a simple set of instructions which are stored once, usually by the manufacturer, and cannot be changed. The data can be read from ROM to the CPU but cannot be written into.

TERMS

ACOUSTIC COUPLER (acoustically-coupled modem)

A device used for computer communication over a phone line. It is a connecting device that sends and receives computer signal directly through the mouthpiece and earpiece of the phone.

ADDRESS

The physical location of a word in the computer's memory or of a record on a disk.

ALGORITHM

A step-by-step procedure, often expressed in mathematical terms for solving a problem or obtaining a particular result.

ALPHA-NUMERIC CHARACTERS

Characters represented either ALPHA-betically, NUMERICally, or using other print characters. For example: A B C D E F 1 2 3 4 5 ? * + -.

APPLICATION

The use of a computer system to accomplish a specific goal.

APPLICATIONS SOFTWARE

Programs designed to instruct the computer to perform real-life tasks (see software).

ARITHMETIC/LOGIC UNIT

This element of the computer performs the basic data manipulations in the central processor. It can perform arithmetic functions and logic operations.

ARRAY

A set of numbers or other entities specifically ordered. The elements of an array can be referred to by their position in the set. These arrays are indicated in many languages by subscripted variables, such as A(X), where X is the subscript.

ARTIFICIAL INTELLIGENCE (AI)

A branch of computer science dealing with the development of machines capable of carrying out functions normally associated with human intelligence such as learning, reasoning, self-correction, and adaptation.

ASCII CHARACTERS (pronounced "as key")

A standard binary code using 8 bits to represent 128 character types (2^8 = 128). It is an acronym for American Standard Code for Information Interchange. Most small computers and terminal products support only a subset of the full ASCII character definition. This includes upper- and lower-case alphabetic characters, numbers, and a set of special symbols.

ASSEMBLER or ASSEMBLY LANGUAGES

Translator languages that allow instructions to the Central Processing Unit (CPU) to be created without having to be in binary code form (also known as machine languages). These languages use mnemonic names to stand for one or more machine language instructions. An assembly language is a "shorthand" method for avoiding the tedious use of long strings of ones and zeros found in the machine language.

AUTHOR or AUTHORING LANGUAGE

These are high-level languages that allow the user to program without having much knowledge of a computer language. Some author languages (e.g., PILOT) determine programming needs through the user's responses to a series of questions, and they provide an appropriate formatted program.

BATCH PROCESSING

This usually refers to the use of punched cards (instead of a computer terminal) to input information and run a program on the computer.

BAUD

The measure of the speed that information can be communicated between two devices. If the data are in the form of alphabetical characters, then 300 baud usually corresponds to about 30 characters per second. It is technically the number of bits transmitted or received per second. Also called baud rate.

BINARY

The binary counting system refers to the number system with a base of two. It also refers to the concept of having only two choices: on and off (1 or 0).

BOOT

An abbreviation for "bootstrap" which is the process of loading the operating system of a computer into main memory and starting its operations.

BREAK

To interrupt a computation or program and return the computer control to a user.

BUG

An error in the computer program. A programming error is called a software bug and a malfunction or design error is called a hardware bug. Debugging is the system of eliminating the program errors.

BUS OR BUSS

A set of wires and connections that is used to transfer information between various computer components: central processing unit (CPU), input/output ports, terminals, and interfaces.

BYTE

Usually an eight-bit unit that by various combinations of 0's and 1's represents both text and control characters in computer code. it can represent either an alpha-numeric character or a number in the range of 0 and 255.

CARDS

Printed-circuit boards. Also refers to punched cards.

CARD READER

A device which reads punched/marked cards or forms as an initial step in computer processing.

CASSETTE TAPES

Audio tapes used for storing programs or data for some microcomputers. The cassette system can be compared to a disk system.

CATHODE RAY TUBE (CRT)

A CRT is a television-like display screen that uses cathode rays to exhibit readable characters or graphic information. It is also known as a monitor.

CENTRAL PROCESSING UNIT (CPU)

This is the brain of the computer which controls what the computer does, defined by a sequence of instructions known as a program.

CHARACTER

A letter, number, punctuation mark or symbol.

CHIP or COMPUTER CHIP

A small, flat piece of silicon on which electronic circuits are etched. Usually 1/4" by 1/4" in shape.

CODE

A synonym for a computer program; therefore, a programmer generates code.

COMMAND

The request to the computer that is executed as soon as it is received.

COMMUNICATIONS NETWORK

This is formed when several individual computers are connected so that files or messages can be sent back and forth between both large information systems and individual users.

COMPILER

A program that converts one computer language into another, in order to store it for later use. It usually refers to a program that translates a higher-level language into a computer's machine language.

COMPUTER

An electronic device that manipulates symbolic information according to a list of precise (and limited) instructions called a program.

COMPUTER-ASSISTED INSTRUCTION (CAI)

CAI is the union of programmed instruction and interactive computer systems capable of providing several types of CAI: drill and practice, problem solving, tutorial, and simulation.

COMPUTER LANGUAGE

An artificial language that was designed to allow communication between human beings and computer systems.

COMPUTER LITERACY

This term is usually used to mean the general range of skills and understanding needed to function effectively in a society that is increasingly more dependent on computer and information technology.

COMPUTER-MANAGED INSTRUCTION (CMI)

Abbreviated as CMI, it is a recordkeeping function of a computer that gives and stores student scores, level of skills, and resources used.

COMPUTER SYSTEM

The computer system is composed of four basic elements:

1. I/O (Input/Output system). Shunts chunks of 0's and 1's.

2. CPU (Central Processing Unit). Adds chunks of 0's and 1's.

3. Memory. Holds groups of 1's and 0's in temporary or permanent form.

4. Control Unit. Mastermind for I/O, CPU, and Memory.

COURSEWARE

Computer programs used for instruction, along with manuals, workbooks and other supporting materials.

CURSOR

The indicator of position, that is seen on a video display screen, which can be moved by various commands such as left, right, up or down.

DATA

Facts you enter into a computer.

DATA BASE

The large collection of related data that is usually in several files. it is generally accessible by the computer which is commonly said to be on-line.

DEBUG

To find and eliminate errors in a computer program. It is also used in reference to fixing electronic circuitry.

DECK

The collection of punched cards that are used in batch processing.

DIRECTORY

A list of the files stored on a peripheral storage device, like a disk. They are usually obtained through the operating system program.

DISK or DISKETTE

A memory device. A flat, circular plate on which digital information can be stored and retrieved magnetically.

DISK DRIVE or MAGNETIC DISK DRIVE

A peripheral device for the storage of programs and other information on either floppy disks or hard disks. Floppy disks are thin flexible plastic tapes with a magnetic recording surface. The floppies are more reliable than the simple audio tapes, but hold less information and operate more slowly than hard disks. Hard disks are made of aluminum and are coated with a magnetic recording surface. On large computer systems, these are the most common form of storage due to the amount of information they can hold, the speed at which they operate, the ease at which the information can be accessed, and their reliability.

DISK OPERATING SYSTEM (DOS)

A collection of programs which can facilitate use of a disk drive.

DISTRIBUTED PROCESSING NETWORKS

The connections between a central computer and remote computer where data are transmitted to the central computer (uploading) for complex processing and then sent back to the remote computer (downloading) for review and further processing. This is similar to timesharing in that the distributed processing networks share the cost and time of the expensive central computer.

DOCUMENTATION

The collection of manuals and instructions that explain the proper use and possible applications of a given piece of hardware or software.

DOT-MATRIX PRINTER

A printer that uses a small array of dots to represent a course image of the characters printed. Most dot-matrix printers which print uppercase characters only use a 5 by 7 matrix of dots to represent each character. The printers that are capable of uppercase and lowercase printing usually use a 7 by 9 matrix of dots to represent a full set of alphabetic characters. The high-resolution dot-matrix devices like the inkjet or precision impact printers which can assemble characters from matrices of 30 by 50 dots that may overlap, are the ultimate in dot-matrix technology.

DOWNTIME

The length of time that a computer or device is not working or is malfunctioning.

DRILL AND PRACTICE

After a student "logs on," the computer presents him or her with prescribed exercises and records the results. The instructor sometimes can retrieve statistics on student's progress.

DUMB TERMINAL

This is an input/output device that does not use an internal CPU. THese require host computers for operation, whereas intelligent terminals have small internal central processing units to handle the terminal's functions and communications.

ELECTROSTATIC PRINTING

In this process, an image is made on a suitable, special-purpose conductive paper by discharging a spark between the printhead electrode and the paper. The spark marks the surface layer of the paper by changing the appearance from a reflective silvery color to the dark color of the underlying layers of the paper.

EXECUTE

To run a program using the instructions given.

FIELD

A group of related characters treated as a unit. An item in a record.

FILE

A collection of related records treated as a unit.

FIRMWARE

The programs that have been wired into the computer by the manufacturer.

FLOATING POINT BASIC

A form of BASIC language that allows the use of decimal numbers. Following calculations, the decimal point "floats" to a new position, as required, giving the term its name.

FLOWCHART

A chart to show the sequence and branching of a particular procedure. This is used frequently in the design of computer programs.

FONT

The set of images associated with a given character set like ASCII, EBCDIC, or the special-purpose sets used in computerized typesetting machines like those used for magazines. A typical font for computer output from an impact printer might be one which duplicates the font of a standard typewriter. For a low-resolution dot-matrix printer, the font might be a program in the printer's read-only memory which translates each ASCII code into a visual representation as a matrix of dots.

GRAPHICS

The techniques of creating visual images by using a computer. Black and white or color television display units are used with personal computers. The graphic displays can be used to display the normal letters, numbers and special symbols of character set, and some personal computers have the ability to draw pictures instead of using words for interactions.

HANDSHAKING

By using this method, two different computer systems (or a computer and a peripheral device) can coordinate communication through some form of interconnection. A key part of this process is the ability to send messages about the status of the communications link, as well as messages that are part of the intended information.

HARDCOPY

The graphic images that are recorded on paper so they are readable by humans, for later reference.

HARDWARE

More properly called computer hardware, it is a collection of physical devices which make up a computer system.

HEXADECIMAL

A number system that uses the base sixteen (2 raised to the fourth power), for its representation of integers. In computers which use byte-sized (8 bit) units of memory, this base provides a more convenient, external, humanly-readable representation of internal data. This base utilizes the set of numeric characters 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 and the six letters A, B, C, D, E, F to represent numbers.

HIGH-LEVEL LANGUAGE

Languages such as FORTRAN, BASIC, COBOL, LOGO and many others that use English-like commands to keep the user from having to employ machine code to communicate with the central processing unit. Typically, one high-level language statement will be equivalent to several machine-level instructions.

IMPACT PRINTING

This method makes a printed image by striking the paper in some way, usually involving a form of ribbon as in a standard typewriter. This method can use the dot-matrix character formation and sometimes use predefined fonts, as in the typewriter or on bands or chains of characters contained in some high-speed printers. This method is capable of producing multiple copies at the same time by using carbon paper or something similar.

INFORMATION RETRIEVAL

The methods used to recover specific information from stored data.

INITIALIZE

To set up the starting conditions necessary in order to run a program. To prepare a diskette or disk so that the computer can store data on it later.

INPUT

Information entered into the computer.

INPUT DEVICE

A peripheral device that allows the user to enter information into the computer, like a keyboard.

INPUT/OUTPUT DEVICE

Abbreviated as I/O device, they are peripheral devices such as video terminals that have both input and output components. An I/O device consists of channels (wires or telephone lines) within the computer system through which information flows. It also includes all the devices at the ends of wires or phones that originate or receive information. Some common I/O devices are: card readers and punches, paper tape readers and punches, typewriter devices, CRT's magnetic tape, auxillary disk systems and line printers.

INTEGRATED CIRCUIT

A very small electronic circuit, that usually consists of a ceramic body 1-5 cm. in length, 1-2 cm. in width, and typically 2 or 3 mm. in thickness, with 4-40 metal leads extending from it.

INTEGER BASIC

A form of BASIC where only whole numbers can be processed (decimal numbers will not work).

INTELLIGENT (DISK, TERMINAL, or OTHER PERIPHERAL)

A component that contains its own CPU so that it can execute instructions without the host's CPU.

INTERFACE

The electronic and physical connection between various electrical and electromechanical devices that allows the different devices to communicate with each other. A serial interface transmits or accepts information one bit at a time, whereas a parallel interface transmits or accepts information one computer word at a time.

INTERPRETER

A computer language translator that translates and executes programs from a high-level language into a machine language, one line at a time.

KEYBOARD

A group of buttons on a pad used to input information into a computer system.

KEYPUNCH

A typewriter-like keyboard device that punches holes (which represent data) in cards.

KILOBYTE or K

A measure of computer memory; approximately one thousand characters. An abbreviation for 1024 (2^{10}).

LARGE SCALE INTEGRATION (LSI)

Refers to the tens of thousands of microscopic electronic circuits that are crowded onto a square space measuring less than 1/8 inch on each side.

LISTING

The actual lines of instruction making up a program.

LOAD

The entering of a program into the memory of the computer from some peripheral storage device. It can also refer to the loading of a register when a few bytes are transferred from the main memory into the registers of the central processor in an assembly language program.

LOGO

The name for this program was coined by Wallace Feurzeig at Bolt Beranek and Newman, Inc., and is derived from the Greek word for "word" or "thought".

MACHINE LANGUAGE

The language that a specific machine was built to understand, written as a sequence of numbers. This language is immediately obeyed by the hardware, but is usually rather inconvenient to use.

MACHINE READABLE

Information is stored on a peripheral storage device so that it can be recorded or played back to the computer.

MAGNETIC TAPE DRIVE

This is also called a tape transport, tape unit or tape deck, that has a reel of magnetic tape mounted to it for access under program control. The tape is used as both a form of memory and for I/O. It can be stored conveniently away from the machine when it is put on a tape drive attached to the computer.

MAINFRAME COMPUTER

The largest-sized computer, used by corporations and the government.

MAIN MEMORY

A random access form of memory that is the primary resource for storage of data and programs in a computer. Main memory is a temporary storage space in contemporary personal computers, and when the power is shut off, the information is lost.

MARK SENSE CARD READER

This is an input device that can read cards which have information marked by graphite pencil.

MASS STORAGE

This technique keeps track of large amounts of permanently available data in a machine-readable form. It is slower in access than main memory, but yields larger potential amounts of data. Mass storage is provided by cassette tapes or floppy disks in most small personal computers.

MEGABYTE OR M

A measure of computer memory; approximately one million characters.

MEMORY

This is also called main memory, core memory, or main storage. The memory is the integrated circuits of a computer on which the information can be stored. This is directly accessible to the CPU. See random access memory (RAM) and read only memory (ROM).

MENU

The list of files and programs on a disk or tape.

MICROCOMPUTER

It appeared around 1972 and is a very small computer with small peripherals. The main differences between the microcomputer and its predecessor, the minicomputer, are their power, size and cost. The microcomputer has a central processing unit that is a microprocessor.

MICROSECOND

One-millionth of a second. Most modern computers can add two numbers in less than one microsecond.

MILLISECOND

One-thousandth of a second.

MINICOMPUTER

This is a small low-cost computer with its peripherals and system software that can be used either as a batch terminal in association with a large computer or as an independent machine. These appeared around 1965, and were physically smaller than their predecessors, the mainframe computers.

MODEM

An abbreviation for modulator/demodulator, it allows communication between computers over phone lines. It translates the computer's digital signals into audio signals and then back again for the receiving computer. An acoustic coupler sends and receives its signals directly through the mouthpiece and earpiece of the phone, whereas the direct-connect modems send and receive through wire connections to the phone.

MODULATOR

An electronic black box that is used to translate the television output signals of the computer into a standard radio frequency television signal which can then be fed into the antenna terminals of a television tuned to the appropriate channel. Usually on R.F. (radio frequency modulator).

MONITOR

See cathod ray tube (CRT).

MOTHERBOARD

A printed circuit board that has slots for various other circuit boards to be plugged into.

NANOSECOND

One-billionth of a second. A very fast modern computer can perform additions at the rate of two every few nanoseconds.

NETWORKING

The sharing of resources or the communication between two computers. See resource sharing networks, communications networks, and distributed processing networks.

NUMERIC PAD

A keyboard for numeric input into a computer.

OBJECT CODE

The machine language form of a program is also called the object code of the program and can be directly loaded into memory and executed, since it has already been translated from it humanly readable form to the internal executable form.

OCTAL

The base eight number system, with the digits 0, 1, 2, 3, 4, 5, 6, 7. Many programmers prefer octal to hexadecimal notation, even though octal is a natural notation of numbers only on machines whose "word size" is a multiple of 3 bits.

ON-LINE

A term which usually refers to the location and connection of devices so that they are immediately accessible to the CPU of a computer. It also commonly refers to information that is directly obtained through a computer as opposed to a book, television, etc.

OPERATING SYSTEM

The systems software (usually created by the manufacturer) that manages the computer and its peripheral devices. This allows the user to run programs and to control the movement of information to and from the computer memory and peripheral devices. See software. Several machine independent operating systems of personal computers also exist that can be run on many different computers. These include the Microsoft forms of BASIC, a very traditional, large, computer-like operating system called CP/M, and the interactive, Pascal language operating system called UCSD Pascal.

OPERATOR

A symbol in a programming language that represents an operation to be performed on one or more operands. For example, "+" (add), or "*" (multiply). Also the person who runs the computer.

OPTICAL SCANNER

An I/O device that reads clearly typed or printed information.

OUTPUT

The information reported by the CPU to any peripheral device. It is generally any data that leave the computer.

PARALLEL INTERFACE

This method plugs a peripheral device into a computer so that whole bytes (or groups of bytes) of data are transferred at one time. Multiple wires are therefore typically found in parallel interfaces. The parallel interface in a printer might include seven or eight data wires from three or five control wires. At the price of a more expensive connector, a much higher data transmission rate results.

PASCAL

This compiled computer language is personal computing's answer to the elaborate, conventional languages of COBOL, Algol and PL/I that are found on larger systems. It was invented by computer scientist Niklaus Wirth (circa 1970) and was initially intended as an aid to teaching computer languages. It now has widespread use in computers of every size, from Apple II computers to the world's largest and faster supercomputer, the Cray-1. Pascal is the language selected for the first computer science Advanced Placement (AP) exam.

PASSWORD

This safety device is essential in order to protect the privacy of a terminal user's programs. Password usage prevents interference by unauthorized terminal users, either accidental or deliberate.

PEEK

An instruction in BASIC that enables the programmer to look at (peek at) any location in programmable memory. It is often used to scan the memory locations which hold the information displayed on the video monitor in order to determine what is being displayed.

PERIPHERAL DEVICES

Devices that can send or receive data to and from a computer. They communicate with the central processing unit and store data in accessible form by use of keyboards, printers, disk drives, music synthesizers, etc.

PILOT

A high level language designed to make it easier for instructors to design software.

PINFEED

This is a standard feature of many computer printers that use paper with holes along both edges in order to keep multiple page printouts in correct alignment.

PIXEL

The smallest available unit of output in a graphics display device that can be controlled by the computer. In a dot matrix printer, the pixel is one dot within the matrix. On a television display device, the pixel is one dot on the screen of the television. Pixels can be black, white or colored, depending on the type of screen used.

POKE

This instruction in BASIC is used to place a value (poke) into any location in programmable memory and is often used in conjunction with PEEK.

PORT

The section of a computer through which the peripheral devices can communicate.

PRINTER

An output device that prints the characters on paper. A KSR or Keyboard Send/Receive option can input as well as output data and converts the printer into a terminal. The RO or Receive Only printer is more common and cannot send data.

PROGRAM

The list of instructions that tells a computer to perform a given task or tasks.

PROGRAMMER

A person who designs and writes a set of instructions for the computer.

PROGRAMMING

Programming is the designing, writing, inputting and testing of a computer program

PROGRAMMING LANGUAGE

See computer language.

PROTOCOL

A set of procedures or conventions used routinely between equipment such as terminals and computers.

QUEUE

A queue is a waiting line within the computer for use of a certain component. These occur most often in a time-sharing or resource-sharing system where several users need to use the same device.

RANDOM ACCESS MEMORY (RAM)

The computer's general purpose memory that is sometimes called read/write memory. RAM may be written to or read from by the Central Processing Unit. Information on RAM is usually volatile; that is, it disappears when power to the computer is turned off.

READ ONLY MEMORY (ROM)

Abbreviated as ROM, it is a memory in which integrated circuits are programmed with special systems programs or a simple set of instructions which are stored once, usually by the manufacturer, and cannot be changed. The data can be read from ROM to the CPU but cannot be written into.

READ/WRITE HEAD

A device inside a disk drive that reads information on a disk. It can also "write" and erase information.

RECORD

A collection of related items of data or fields treated as a unit.

RELIABILITY

The measure of frequency of failure of the computer and other hardware.

REMOTE ACCESS

Terminals that are physically away from the central computer system (e.g., across town, or across campus) at "remote stations".

RESPONSE TIME

The time interval between the request for a job to be done and when the user receives the results. This is also called turnaround time.

RS-232 INTERFACE

A data communications industry standard for the serial transmission of data to a peripheral device, such as a printer, a video monitor, a plotter, etc.

RUN

The continuous performance of the list of instructions in a given program or procedure. It is also the command to run a program (RUN). When a computer is executing a program, we say it is being run.

SAVE

To store a program on a peripheral storage device for later use. It is also a command.

SCROLLING

The movement of lines on a video display, vertically in such a way that the top line disappears and a new bottom line comes into view at the bottom of the screen.

SERIAL INTERFACE

This interface between a computer and a peripheral device can be done over as few as 3 wires. It is usually slower than the equivalent parallel-communications interface, since each of the eight bits of a byte must be funneled through one wire in each direction. See interface.

SILICON

A common element in the earth's crust (found in sand and glass), used for making computer chips.

SIMULATIONS

Games and representations of real life situations. Simulations are feasible when real life situations. Simulations are feasible when real life equipment is too expensive or complex (e.g., cyclotron, nuclear reactor); measurement is impossible or disturbs the system (velocity of a falling body); experimental technique required is too complex (e.g., political promotion, science lab techniques); time scale is too long range (genetic studies, population dynamics, economic or atomic reaction, explosive or toxic substances); and finally, when a problem requires extensive data collection and/or bookkeeping.

SOFTWARE

Computer programs that consist of a list of instructions that tell a computer to perform a given task or tasks. There are two basic types of software. Systems software enables the computer to carry out its basic operations. Examples include operating systems, language interpreters or utility programs. Applications software consists of programs that instruct the computer to perform various real-world tasks such as writing checks, playing chess or testing students.

SOURCE PROGRAM

When a program is written by a human being, its source program is the humanly readable form seen on the terminal. The source program gets edited, changed and updated in the process of creating a program. The translator program operates on the source language to produce the object code of the machine language.

STATEMENT

The single meaningful expression or instruction in a high-level language such as FORTRAN, BASIC or COBOL.

STORAGE

This is also known as memory. Some typical forms of storing data for a later time are: magnetic disks, which are flat spinning disks with magnetizable surfaces; magnetic drums, which hold more than 11 million bytes and take about 2.5 milliseconds to retrieve; and punched cards, which hold 80 letters or numbers.

STRING

A group of characters stored by their numeric codes that are used in high-level languages such ad BASIC.

TAPE DRIVE

A peripheral device for the storage of programs and other information onto magnetic tape.

TAPES

An inexpensive mass storage medium which is convenient for large files or archival storage. Data is retrieved sequentially rather than randomly on tape medium.

TELECOMMUNICATIONS

This is the art and practice of sending computer (or verbal) messages through the telephone network or via radio. In the field of personal computering it refers to the use of serial communications techniques and modems that allow messages to be sent via telephone to other personal computers or to centralized information services.

TERMINAL

An input/output device that is intended for the user to interact directly with the machine. It consists of a keyboard through which the user can send information to the computer and a printer or display device through which the computer can present information to the user.

THERMAL PRINTING

A method of scanning special heat-sensitive paper by moving a printhead which contains a dot matrix of electronically controllable heated areas. The heated zones are turned on if a dot image is to be recorded as part of the dot matrix representation of a character during the paper scan.

TIMESHARING

A system where many users of a central processing unit obtain services for short intervals of time. This allows each user to run a program while others are also using the system. The connections are made through direct wires or modems and telephone wires.

TOUCH PANEL

A device that is sensitive to touch, attached to the front of the terminal display screen. It is used to input information at a particular screen location.

TURTLE

A graphic representation of a computer-based robot that can be moved around the computer screen with commands such as FORWARD, BACK, RIGHT, etc.

TURTLE GEOMETRY

A new mathematics based on turtle movement that emphasizes transformations in local space rather than relationships to a fixed global reference point.

TUTORIAL

CAI program which provides actual instruction instead of the teacher. The computer "tells and asks" the student facts and questions, and the teacher takes on the role of consultant or resource person.

UPLOAD

See distributed processing networks.

UTILITY PROGRAMS

The systems software that allows the computer to perform certain basic functions like copying the contents of one disk onto another.

VARIABLE

A variable in a computer language can be thought of as a memory location into which a character or a number may be stored. It usually has a symbolic name which is created by the person writing the program.

VIDEO TERMINAL

A terminal that uses a video display unit like a monitor or CRT as its output device. See cathod ray tube.

VOLATILE

Information that disappears from the memory of the computer when the power is turned off.

WORD

A computer word can vary from 8-65 bits, but most personal computer manufacturers generally use an 8-bit word, which represents the number of bits processed and addressed at one time by the central processor.

APPENDIX D

BONUS ACTIVITIES

THE ABACUS

Essential Element Addressed:

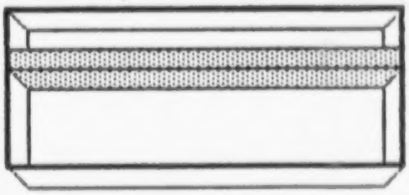
History and Development of Computers

Material(s):

Small box, string, tape, beads, glue, pencil or marker

Instructions for Making It:

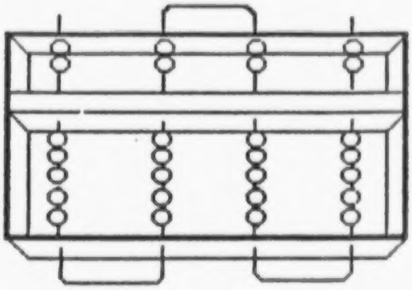
1. Push the box lid or other divider into the box so it is parallel to the bottom and perpendicular to the sides. Trim for a tight fit and glue the lid permanently into position.



2. Measure the long side of the box. Make four holes, equal distance apart, on the top of the box, the bottom of the box, and the lid on the center of the box.

3. Wind tape around the end of a long string to make it easy to thread through the holes in the box.

4. Use the diagram below to guide you in threading the string through the holes in the box and for placing the correct number of beads in each section of the abacus.



5. After making sure the string is pulled tight, fasten the ends of the string with tape or by other means.

Instructions for Using It:

1. All beads below the center bar represent the value of 1.
2. The two beads above the center bar each represent a value of 5.
3. Reading from right to left, each string represents place values of 10.
4. The first row of beads on the right represents the numbers 1-9. When another bead is added, the number becomes 10 and it is necessary to move a bead in the second row which represents tens.
5. The numbers in the next row are hundreds.
6. The numbers in the next row are thousands.

NAPIER'S BONES

Essential Element Addressed:

History and Development of Computers

Material(s):

Heavy paper (11" x 10"), black marker, ruler, scissors

Instructions for Making It:

1. Divide the 11" x 10" paper into 1" squares.
2. Draw a key on the top square on the left-hand side.
3. Write the numbers 1-9, one number per square, in each square on the left-hand column.
4. Write the numbers 1-9, one number per square, in each square on the top row.
5. Use a black marker to connect opposite corners of each of the remaining squares with a diagonal line.
6. Match each number across the top with each number written down the side, writing in the product obtained from multiplication of the two numbers in the square where the two meet. The first digit in the product should be written above the diagonal line, and the second digit below it. If the product is a one digit number, place that digit in the bottom space, and write a 0 in the space above. An example follows:

	1	2	3	4	5	6	7	8	9
1	0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9
2	0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8
3	0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7
4	0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6
5	0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5
6	0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4
7	0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3
8	0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2
9	0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1

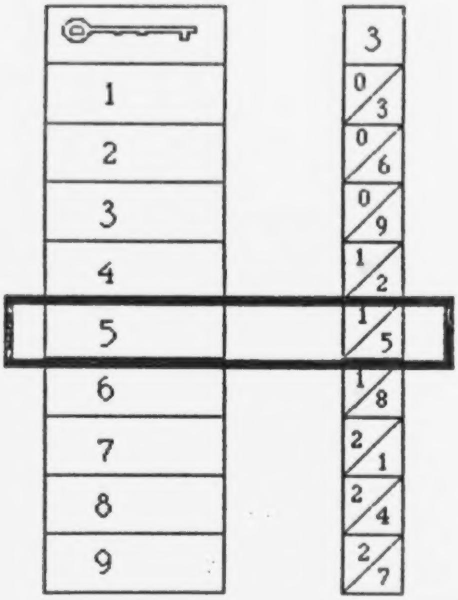
7. Cut out each column on the sheet so that they can be handled separately for use in solving multiplication problems.

Instructions for Using It:

1. To solve one-digit multiplication problems with Napier's Bones:

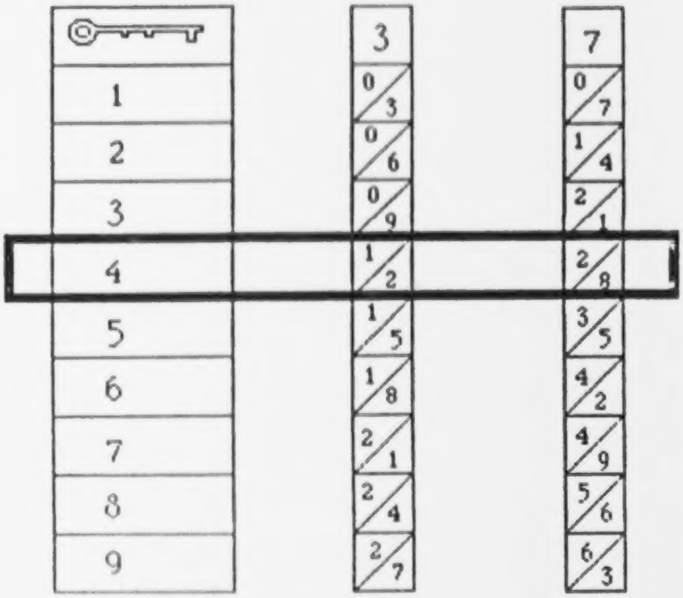
   Line up the key card and the card for the number being multiplied.

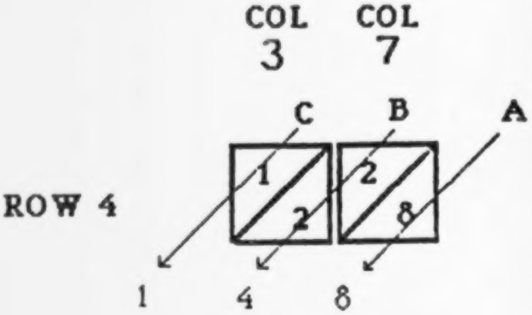
   Example: To multiply 5 x 3, line up the key and the 3 card. Move down the key card to 5 and then move straight across. You come to the answer 15.



2. To solve multiplication problems with one two-digit number:

Example: To multiply 37 x 4, line up key card, 3 card, and 7 card. To get an answer, start at A and record the number there in the one's place. At B we find two numbers in line, so they are added to get 4. The result of B will be placed in the ten's place. The answer for 37 x 4 is, then 148.

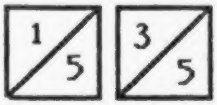




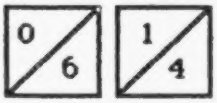
3. To solve multiplication problems with two-digit numbers:

Example: To multiply 37 x 25, work with the number in the one's place (5) first.

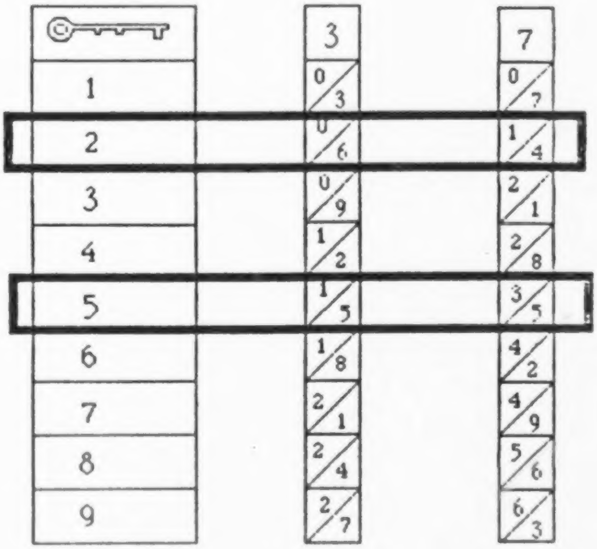
Multiplying 37 x 5 will result in:

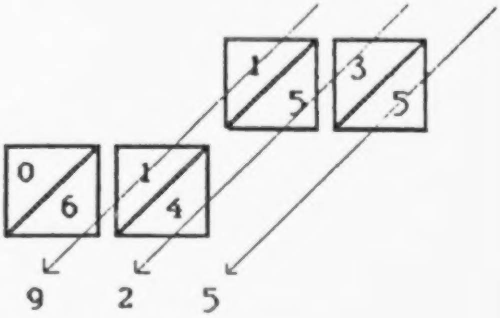


Multiplying 37 x 2 will result in:

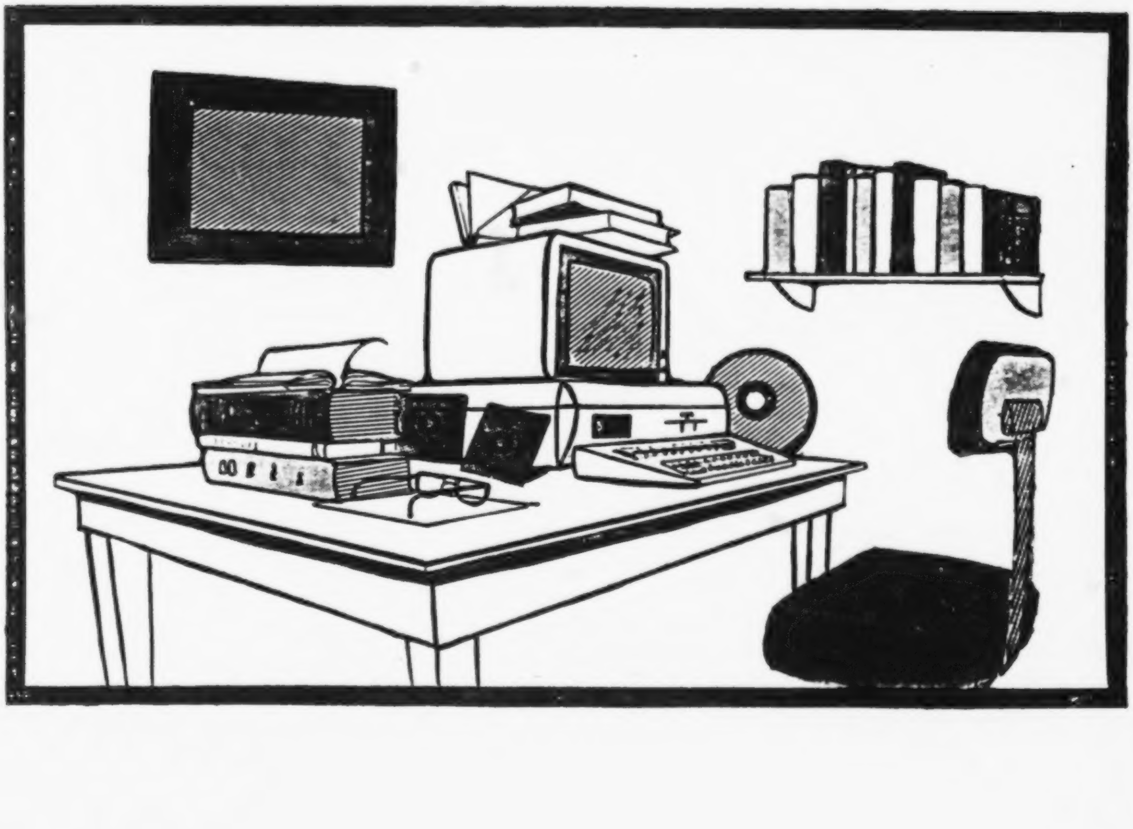


Line up the numbers to find the product. The 5 was in the one's place and the 2 in the ten's place in the problem, so numbers must be lined up in this manner.





RESOURCES



RESOURCES

TEACHER REFERENCES AND RECOMMENDED PERIODICALS

TEACHER REFERENCES

BASIC Discoveries. Linda Malone and Jerry Johnson. Creative Publications. 1981.

Computer Consciousness: Surviving the Automated 80's. Domini H. Covvey. Addison-Wesley. 1980.

Computer Literacy: A Hands-On Approach. Arthur Luehrmann and Herbert Peckham. McGraw-Hill. 1983.

Computer Literacy Curriculum Guide. Texas Education Agency, Austin, Texas. 1985.

Computer Literacy: Issues and Directions for 1985. Robert Seidel, Ronald Anderson, and Beverly Hunter. Academic Press. 1982.

Computer Literacy--Programming, Problem Solving, Projects On the Apple. Warren and Bobbie Jones, Kevin Bowyer and Mel Ray. Reston Publishing Company, Inc. 1983.

Computer Literacy--Problem Solving with Computers. Carin E. Horn and James L. Poirot. Sterling Swift Publishing Company. 1981.

Computers for Kids; Apple II plus. Sally Larsen. Creative Computing Press. 1981.

Computers for Kids; Atari Edition. Sally Larsen. Creative Computing Press. 1981.

Computers for Kids; TRS-80 Edition. Sally Larsen. Creative Computing Press. 1980.

Computers for Kids; Vic-20 Edition. Sally Larsen. Creative Computing Press. 1983.

Computers in the Classroom. Henry S. Kepner, Jr., ed. Goodson. Addison-Wesley. 1982.

Computers, Teaching and Learning. Jerry W. Willis et al. Dilithium Press. 1983.

Computers Today. Donald H. Sanders. McGraw-Hill. 1983.

Courseware in the Classroom. Ann Lathrop and Bobby Goodson. Addison-Wesley. 1983.

Kids and the (Apple, IBM or Commodore). Edward H. Carlson. Datamost. 1982.

Microcomputers: A Parent's Guide. Kenneth P. Goldberg and Robert D. Sherwood. John Wiley & Sons, Inc. 1983.

Mindstorms: Children, Computers and Powerful Ideas. Seymour Papert. Basic Books. 1980.

My Students Use Computers. Beverly Hunter. Reston. 1983.

Practical Gude to Computers in Education. Peter Coburn et al. Addison-Wesley. 1982.

Programming the IBM Personal Computer: BASIC. Neill Graham. Holt. 1983.

Scholastic Computing--An Introduction to Computers. Jack L. Roberts. Scholastic Inc. 1984.

School Administrator's Introduction to Instructional Use of Computers. David Moursund. International Council for Computers in Education. 1980.

Spotlight on Computer Literacy. Ellen Richman. Random House. 1985.

Teaching BASIC Bit by Bit. Batya Friedman and Twila Slesnick. MCEP, Lawrence Hall of Science, University of California, Berkley, CA. 1980.

The Mind Tool: Computers and Their Impact on Society, 2nd edition. Neill Graham. West Publishing Company. 1981.

Using A Microcomuter in the Classroom. Gary G. Bitter and Ruth A. Camuse. Reston. 1984.

RECOMMENDED PERIODICALS

Educational Periodicals

ACM SIGCUE Bulletin; Association for Computing Machinery; P.O. Box 12015, Church Street Station, NY 10249

AEDS Journal and AEDS Monitor; Association for Educational Data Systems; 1201 Sixteenth St., NW, Washington, DC 20036

Classroom Computer Learning; Classroom Computer News; 5615 West Carmel Road, Cicero, IL 60650

Educational Technology; 140 Sylvan Avenue, Engelwood Cliffs, NJ 07632

Electronic Learning; Scholastic Inc., 901 Sylvan Avenue, Englewood Cliffs, NJ 07632

Microcomputers in Education; QUEUE, 5 Chapel Hill Drive, Fairfield, CT 06432

Recreational Computing; P.O. Box E, 1263 El Camino Real, Menlo Park, CA 94025

The Computing Teacher; International Council for Computers in Education, Department of Computer and Information Science, University of Oregon, Eugene, OR 97403

Teaching and Computers; Scholastic Inc., 730 Broadway, New York, NY 10003

Periodicals

A+ (Apple); Ziff-Davis Publishing, One Park Avenue, New York, NY 10016

BYTE; 70 Main Street, Peterborough, NH 03458

Compute!; Small Systems Services, Inc., Greensboro, NC 27403

Creative Computing; Elizabeth Styles, ed., P.O. Box 789-M, Morristown, NJ 07960

80-Micro; 80 Pine Street, Petersborough, NH 03458

Family Computing; Scholastic, Inc., 730 Broadway, New York, NY 10003

InforWorld; 530 Lytton Avenue, Palo Alto, CA 94301

Nibble (Apple); P.O. Box 325, Lincoln, MA 01773

PC World (IBM); Subscription Department, P.O. Box 6700, Bergenfield, NJ 07621

Personal Computing; P.O. Box 1408, Riverton, NJ 08077

Popular Computing; Byte Publications, Inc., P.O. Box 307, Martinsville, NJ 08836

SoftSide; P.O. Box 68, Milford, NH 03055

Softtalk (for IBM, Apple); 7250 Laurel Canyon Blvd., North Hollywood, CA 91605

Source World; Source Telecomputing Corporation, 1516 Anderson Road, McLean, VA 22102

RESOURCES

FILMS AND VIDEOTAPES

AUDIOVISUAL SERVICES
641 18th Avenue
Honolulu, HI 96816

Ph: 732-2824

16mm Films

7705 AND WHAT OF THE FUTURE?
Films Incorporated, 1981
40 min.; J-H
Will the recent developments in electronic microcircuitry result in a better or worse life for the average person? Will people lose jobs once thought secure? Will the technology be used to replace people on monotonous or dangerous jobs? Visits to the Washington D.C. Metro (subway), a Dallas supermarket, and a Scottish hospital illustrate the benefits and problems.

7724 THE COMPUTER AND YOU - AN INTRODUCTION
Handel Film Corporation, 1983
16 min.; E-J
A primer for computer operations designed for audiences who have no prior knowledge in this field. The computer terms come to life by watching a student developing a program about the states in the USA and the provinces of Canada.

6702 COMPUTER COLOR GENERATIONS
United States Department of Energy, 1972
23 min.; J-H C
Discusses new techniques in computer technology which virtually eliminate the extra cost of color in computer displays. Includes research on thermonuclear problems, lasers, engineering and three dimensional problems.

6703 COMPUTER FLUID DYNAMICS
United State Department of Energy, 1969
24 min.; J-H C
Demonstrates the power of today's giant electronic computers for solving problems that previously were impractical to undertake. presents a wide range of fluid flow problems, shows several examples of fluid flow calculations, and describes how computer calculations are accomplished.

7940 COMPUTER: TOOL FOR THE FUTURE
National Geographic, 1984
23 min.; J-H T
The film begins with the human need to compute, surveying several computing devices that preceded the chip and focusing on significant computer applications. Computer careers are considered--everything from the military to music. This film stresses the importance of computers in our modern society.

7682 COMPUTERS AND THE FUTURE
Time-Life Media, 1982
30 min.; J-H
Combining documentary techniques with vignettes, the film explores our growing relationship with communications technologies such as interactive computers, cable television and video discs. The program explores the effect of this new media form on the way we live, work and play. Futurologist Peter Schwartz is host.

7798 COMPUTERS: THE FRIENDLY INVASION
Walt Disney Educational Media Company, 1982
20 min.; E-H
Computer graphics and scenes from the Disney feature "Tron" illustrate some computer applications in an entertaining film that introduces students to a future resource. They are introduced to how computers work, the many tasks they can perform, and the opportunities they offer in science and the arts.

7668 COMPUTERS: TOOLS FOR PEOPLE
Churchill Films, 1983
22 min.; E-H T
Shows how computers are used in many ways: for file management; control of other machines; support of creative work; and for mathematical tasks including modeling. Demonstrates how applications are developed through research, flowcharting, programming and debugging. Emphasizes the human responsibility for computer performance and the excitement of people creating their own tools.

7922 DON'T BOTHER ME, I'M LEARNING:
ADVENTURES IN COMPUTER EDUCATION:
MGHT, 1981
24 min.; E-H T
This motivating film demonstrates uses of a computer in a classroom. Teachers, parents and students all eagerly discuss the vast uses of the computer.

7473 MIND MACHINES, THE PARTS I & II
Time-Life Media, 1979
57 min.; H C
The controversy surrounding artificial intelligence is examined. Computer fundamentals are explained and compared to human intelligence. Limitations of computers to memory and calculations functions are used to argue the nature of human intelligence which includes judgement, common sense, etc.

7707 NOW THE CHIPS ARE DOWN, PARTS I & II
Films Incorporated, 1981
50 min.; J-H C A T
Microprocessor smaller than a postage stamp have the power of room-sized computers of a generation ago. We hear a machine

that can read aloud, see a driverless tractor and a warehouse that needs no staff among the samples of the wonders created by cheap computer power. We also learn how micro-computers are made, and hear predictions of the future changes.

7929 ROBOT REVOLUTION, THE
EBEC, 1984
19 min., J-H C
This probing look at robots--their capabilities and their limitations--explores their potential for improving the quality of life and their threat the labor force as they enter the workplace. Shows the effects of using computers and robots in medicine, research, business and industry.

7591 ROBOTS - INTELLIGENT MACHINES SERVING MANKIND
Pacific Resources, Inc., 1981
14 min.; J-H
The film presents a report of an army of "intelligent machines" taking over more and more jobs that were previously performed by workers. Benefits derived by this major revolution in computer technology are: safer working conditions, high quality products and more efficient use of resources. This report includes robots with limited touch, sight and judgement...first steps in the mechanical evolution.

6858 TIC - INDEX TO ENERGY
United States Department of Energy, 1977
6 min.; H C A
Describes the Technical Information Center (TIC) of the Department of Energy at Oak Ridge, Tennessee. The computerized facility gathers, abstracts and catalogues technical reports and published scientific papers from sources around the world. This material is evaluated and part of it becomes a permanent part of the data bank of technical and scientific energy information.

7901 WELCOME TO THE FUTURE: COMPUTERS IN THE CLASSROOM:
FI, 1982
28 min., C T
In plain language, this film introduces teachers to computer literacy: programming languages, software and the variety of ways computers can be used in schools, such as computer assisted instruction. This film helps demystify computers and shows how teachers and students can become friends with a machine.

TECHNICAL ASSISTANCE CENTER
3645 Waialae Avenue, Room B-6
Honolulu, HI 96816

Ph: 735-2825

Videotapes

R199-1	BEYOND THE PROGRAM Great Plains National, 1980 20 mins., Color (Business Computing...Cut Down to Size); A Outlines elements of data reliability and accuracy and stresses the need for safeguards. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.
R197-1	COMMUNICATING WITH YOUR COMPUTER Great Plains National, 1980 27 min., Color (Business Computing...Cut Down to Size); A Introduces and compares elements of programming languages. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.
0890-1	COMPUTER COLOR GENERATIONS ERDA, 1972 23 mins., Color; J-H C Discusses new techniques in computer technology which virtually eliminate the extra cost of color in computer displays. Includes research on thermonuclear problems, laser, engineering and three dimensional problems.
0911-1	COMPUTER FLUID DYNAMICS ERDA, 1969 24 mins., Color; J-H C Demonstrates the power of today's giant electronic computers for solving problems that previously were impractical to undertake. Presents the wide range of fluid flow calculations and describes how computer calculations are accomplished.
0815-2	COMPUTER FRIEND WPBT Public Television, 1976 30 mins., Color (Que Pasa, USA?); H A Carmen fills out an application for a computer program that matches up people of similar interests and family backgrounds. Spanish/English program.
1768-1	COMPUTER SHOW #1, THE Oceanic Cablevision, Inc., 1984 27 min., Color (The Computer Show); J-H A In a magazine format: computer applications in the travel industry; tutorial on the components functions and operation of a microcomputer; care and maintenance of computers; introduction to programming in Logo.

1768-2 COMPUTER SHOW #2, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Continuation of show #1 with emphasis on the care and maintenance of computers, use of word processors and printers.

1804-1 COMPUTER SHOW #3, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
David Kobashigawa of Radio Shack demonstrates the use of a computer spread sheet. The film defines some computer language, gives computer care tips and describes various types of printer papers.

1854-1 COMPUTER SHOW #4, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Demonstrates computer programming in BASIC and explains some of its terms. Describes what computers can do and how they work. Explores the serious problem of software piracy.

1854-2 COMPUTER SHOW #5, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Briefly demonstrates features of a computer operating system designed for multi-user business applications, the Northstar "Dimension" system; this is followed by a demonstration of software called "Color Paint." Both programs are designed for IBM-PC computers.

1851-2 COMPUTER SHOW #6, THE
Oceanic Cablevision, Inc., 1984
30 min., Color (The Computer Show); J-H A
Minidocumentaries in this program feature computers: computerized music, computers in designing and manufacturing, a young science fair winner who is a computer whiz, a new way of notating dance, and the work of robots, present and future.

1282-1 COMPUTERS
Hawai'i Public Television, 1980
60 mins., Color (Dialog); H C A
Presents a group of computer experts who discusses the use of computers, their advantages and possible disadvantages. The question is--what is the future of computers, will they compete with people for jobs? NOT FOR CATV USE.

1278-4 COMPUTERS
Hawai'i Public Television, 1980
10 mins., Color (Dialog); H C A
Edited version of "Computers" without the panel discussion. Shows only the mini-documentary of the topic up for discussion.

0112-1 COMPUTERS
Hawai'i Public Television, 1982
59 mins., Color (Dialog); H C A T
This program examines the numerous functions and disadvantages of having personal computers. It also describes the different brands of computers and their most effective use, especially by the average person. NOT FOR CATV USE.

0088-2 COMPUTERS
Hawai'i Public Television, 1982
6 min., Color (Dialog); H C A T
Edited version of "Computers" without the panel discussion. Shows only the mini-documentary of the topic up for discussion.

1756-1 COMPUTERS
WETA-TV, Washington, D.C., 1983
26 min., Color (Spaces); J-H
Minidocumentaries in this program feature computers: computerized music, computers in designing and manufacturing, a young science fair winner who is a computer whiz, a new way of notating dance, and the work of robots, present and future.

R129-1 COMPUTERS AND THE FUTURE
Time-Life Video, 1982
30 mins., Color; J-H A
Combining documentary techniques with vignettes, the film explores our growing relationship with communications technologies such as interactive computers, cable television and media forms on the way we live, work and play. Futurologist Peter Schwartz is host. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1664-2 DATA PROCESSING
kapi'olani Community College, 1983
12 mins., Color (A Career in Focus); J-H
In the business world, computers play a major role in data processing accounting, and record keeping. This program describes the duties and work of computer operators, computer programmers, data entry clerks and control clerks. KCC offers a two-year course in computer education.

EVOLUTION: COMPUTERS, YESTERDAY AND TODAY
BNA Communications, Inc., 1983
30 min.; J-H A
This film presents the history of four generations of computers. Included are the people and the companies that developed them.

R196-1 FITTING OUT
Great Plains National, 1980
15 mins., Color (Business Computing...Cut Down to Size); A
Offers guidelines on determining the capabilities of computer systems (size, storage maintenance). LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

R195-1 MEASURING UP
Great Plains National, 1980
15 mins., Color (Business Computing...Cut Down to Size); A
Details applications and types of small computers and their integration into a business. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1593-1 TIC - Index to Energy
U.S. Department of Energy, 1977
6 min., Color; C A
Describes the Technical Information Center (TIC) of the Department of Energy at Oak Ridge, Tennessee. The computerized facility gathers, abstracts and catalogues technical reports around the world. This material is evaluated and becomes a permanent part of a data bank of technical and scientific energy information.

R198-1 UNDERSTANDING SOFTWARE
Great Plains National, 1980
16 mins., Color (Business Computing...Cut Down to Size); A
Discusses types, applications and the choosing of software. LOAN ONLY. NOT FOR CATV USE. NOT AVAILABLE TO PUBLIC LIBRARIES.

1745-1 WHY IN THE WORLD #245
WNET & Satellite Education Services, Inc., 1984
30 min., Color (Why in the World); J H A
Topic: Computers and the changes they bring to America---how people live and work. Guest: John F. Akers, President of IBM Corporation.